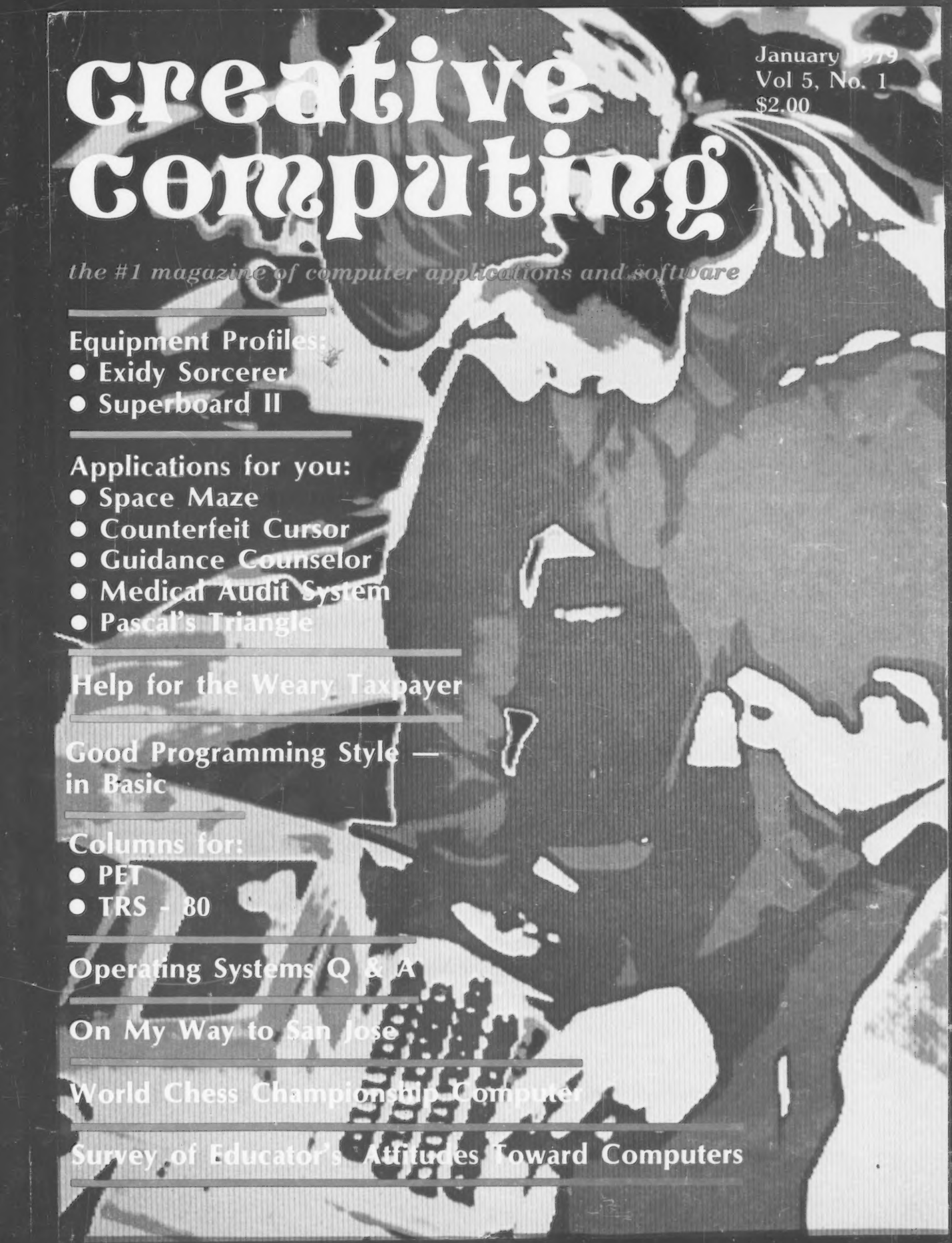

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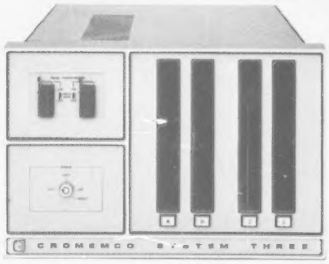

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Our cover was produced from a black and white photograph using the Metacolor System of electronic graphics. A complete article on this system appeared in *Creative Computing* Sept/Oct. 1977, pp. 134-137. For information about this powerful graphics tool write, Eric Morey, Metacolor, 855 Sansome St., San Francisco, CA 94111

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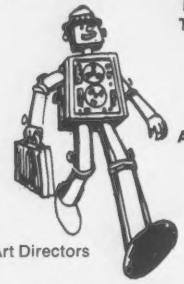

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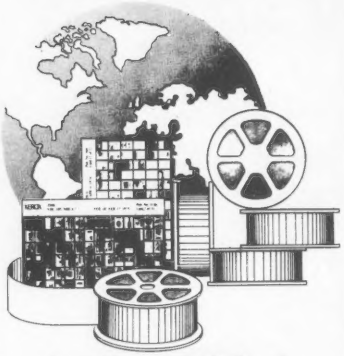

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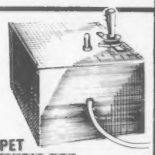

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Input Output

Arcade Owners, Unite!

Dear Editor:

As an owner of a Bally ARCADE, I want to thank you for publishing Mr. Zinn's article/review on Bally BASIC. Local outlets have not yet received the BASIC cassette, but after reading the review, I am quite anxious to try it.

I first picked up your magazine only 2 issues ago, and I am very pleased to have discovered it. *Creative Computing* is quite a boon to computer newcomers like myself, as it presents technical data in an understandable manner. I am also happy to see you stress software in your editorial content. Perhaps with the growing number of Bally ARCADES being distributed in the US, you will publish other programs designed for Bally BASIC like the "Guess the Number" program with Mr. Zinn's article.

Recently, I heard rumors of a nation-wide ARCADE users organization based in California called the ARCADIANS. If you or any *Creative Computing* reader has any information on how I can get in touch with this group, I'd very much like to hear about it.

Once again, thanks for such an excellent magazine.

Guy W. McLimore, Jr.
2304 Harding Avenue
Evansville, IN 47711

Guy, you and all the other Bally owners want to get in touch with Bob Fabris who has organized the Arcadians User Group. Subscription to the newsletter is $5 per year. Address is: Arcadians, 3626 Morrie Dr., San Jose CA 95127.—John.

A Big Mistake

Dear Editor:

I must confess that I have committed the "Crime of the Century", even greater that the Brinks Robbery, yet it had nothing to do with theft, murder, or anything else like that: I simply didn't subscribe to *Creative Computing* for the first *3 YEARS* of its publication.

I realize now what a mistake I made for I was finally convinced to subscribe just a little while ago. After reading my first copy I knew that I had been letting life (and *Creative Computing*) pass me by. And me, an aspiring young student hoping for a job in the computer field!

I am happy to say that I'm now trying to reform. In my attempt to salvage something of the last 3 years I have purchased volume 3 from Creative Computing Press. And, should you decide to publish this testimonial, I would like to tell all those dedicated *Creative Computing* readers that if they have any copies of this wonderful magazine from volumes 1 and/or 2, or number 1 from volume 4, that they would like to get rid of (now that they have "The Best of *Creative Computing*—Vols. 1 & 2" instead) I'll gladly pay for them. Just send me a letter telling me what you have and what condition they're in.

Please, help a guy try to get back into the mainstream of computer science.

Scott J. Walker
R.R. #2
Pine Island, MN 55963

We do our best to keep such over-complimentary letters out of here ... but occasionally one sneaks through!—John.

Some Words About Service

Dear Editor:

We enjoy the magazine thoroughly and want to pass on our experience for the benefit of your other avid readers. We found our ideal computer company with the COMPUCOLOR II people. We recommend them to anyone who wants good, old-fashioned customer service. We received our beautiful Compucolor II several weeks *before* the promised date (unheard of)! They have a Hot Line for immediate, authoritative help on software and hardware problems, give same-day service and seem to have a no-argument warranty plan.

We have been pleasantly surprised at every contact with them and know from experience how much this will be appreciated by hobbyists too long frustrated by the incomplete, late and lackadaisical service given by many computer manufacturers.

W.A. Shanks
3 Honey Lane West
Miller Place, NY 11764

What Does Big Foot Wear?

Dear Editor:

I am writing to point out an error in "My Friend, Big Foot", appearing in the Input/Output column on page 12 of the September-October 1978 issue, contributed by Lou Elkins. The calculation given will not answer the question, "What does Bigfoot wear?". The correct answer may be obtained however from this calculation:

8 x 17 x 39 x 10,000 + 5618
(turn over calculator for answer)

Your readers might be interested in this correction.

Jeff Miller
PO Box 27501
Tucson AZ 85726

Thank you, Jeff, thank you. It was a minor error, or shall we say shortsightedness, on Lou's part ... and it's doubtful if many people even caught it.—John.

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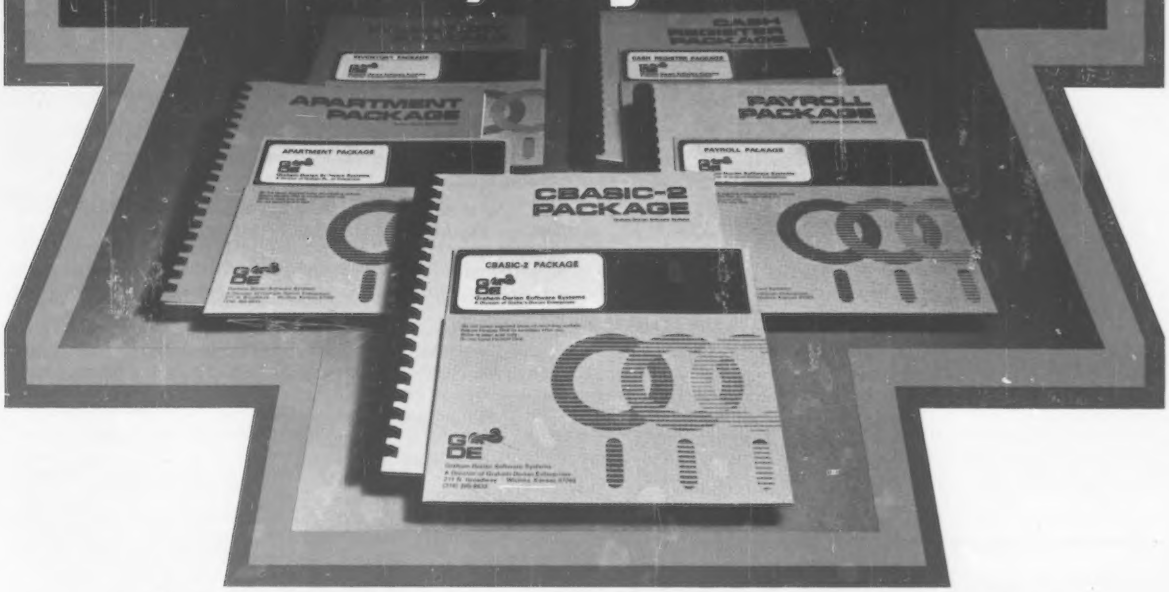
you can use in your business... ready to go now!



Our programs will let you realize the full potential of your hardware.

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Give us a call or fill out the Reader Service Card in this issue. We promise a response within 24 hours of receipt. That's the kind of information service we expect, and know you do too.

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CIRCLE 119 ON READER SERVICE CARD

BASIC and the Personal Computer!

Dear Editor,

This is both a fan letter and a request for a reprint.

I am not a programmer, but my husband is. Our house is full of programming magazines, and I have recently started reading them. I find your magazine to be the best. Many articles are clear and graspable by the lay reader (at least to me, a psychology teacher). Your humour is outrageously funny; your graphics are superb. I love your magazine, and look forward to reading it the minute I can wrench it from my husband's hands each month.

One article (actually a series of articles) which particularly impressed me was Thomas Dwyer's "The 8-Hour Wonder." We have parts 2, 3, and 4. After reading part 2, I sat down and wrote my first program, using nested For-Next loops. It was my first programming experience, and it ran!!! Wow! Anyway, now, I am going crazy to get a copy of the issue with part 1 (July-August 1977). I contacted our Data Processing Dept., the school library, computer and electronic stores to no avail. If you could send me a reprint of that article in the July-Aug 1977 issue, I would be very grateful.

Lynn Buckley
Miami-Dade Community College
South Campus
11011 S.W. 104 Street
Miami, Florida 33176

We don't have reprints of the article you were asking about although the four back issues are available for $2.00 each. However, those articles were excerpts from a book Thomas Dwyer was writing. The book has now been published, by Addison-Wesley, and is called "BASIC and the Personal Computer." It is, without a doubt, one of the best books on Basic I've ever seen! It's available from Creative Computing Press for $12.95 plus $1.00 shipping.—JTC

A TRS-80 Bug?

Dear Editor:

TRS-80 owners might want to know that they have at least one bug in their Level-1 BASIC interpreter. They shouldn't always suspect their hardware when funny things start happening.

I discovered the problem quite by accident, while playing Radio Shack's own Blackjack game. About to choose a hit or stay, I accidentally indexed "11" instead of "1". The program correctly rejected the entry. However, Blackjack blew up once the proper number had been entered. I found that the first line of the program including the line number, had been overwritten with data!

Fearing the worst, I visited two local Radio Shacks in order to try to reproduce the problem on their machines. I succeeded, on both 4k and 16k systems and with *their* Blackjack tapes. So the bug appeared to be a firmware problem.

After a few hours of work, I isolated the error to the following routine:

```
10 F. M = 1 to 1
20 IN. X
30 ON X G. 1400, 1500
40 G. 20
1400 P. "OK"
1500 N.M: P. "OK"
```

Start the above program. Index "11", ENTER. Then index "1", ENTER. If you list the program upon its completion, the first line (10) should contain garbage.

The bug arises because an "ON GOTO" (or "ON GOSUB") instruction is nested within a "FOR" loop. Everything works ok unless the variable used by the GOTO contains a value outside the expected range of branch addresses. The solution is to always verify that value with "IF"'s.

Gary L. Barrett
Box 40
Brower Avenue
Oaks, Pennsylvania 19456

A Sexist Magazine?

Dear Editor:

I was appalled and surprised to find you assume all your potential readers are men. I have enclosed a few of the blatantly sexist pictures and comments you published in your Sept/Oct 1978 issue. To show women doing drudge housework while men are shown doing all the interesting computer work (except for a few elementary school girls) shows you are years behind in social awareness. How can you thus expect to maintain credibility as a magazine in the forefront of computer technology?

I was pleased to see Margot Critchfield's inclusion on your Associate Editor staff. But, if your working conditions are akin to your editorial policy I can't imagine bright women of her caliber will stay around long.

I have enjoyed many of the articles in Creative Computing and am sorry to have to seek out a magazine edited by people with a less tunnel visioned sense of the world.

Linda Malone
Computer Consultant
Seattle WA 98115

You were appalled and surprised? I was appalled and surprised that you would pick on that poor cartoon showing three women doing housework!! The cartoon was there to illustrate the problem . . . not offend super-sensitive feminists who are so hung up on their trip that they can't find anything better to do than search through magazines looking for "offensive" material! And what is it that you dislike about Barbara Corser's face? Is it unpleasant to look at? Is it the two staple holes you put below each of her eyes? Then we have the "Ask Your Dad About Girls" cartoon. You're grasping for straws, Linda. I really think you're getting desperate on that one. However, I will concede that the cover of the Colossal Computer Cartoon Book is sexist (in my opinion) and in relatively poor taste.

As far as our staff goes, why did you single out Margot Critchfield? Our managing editor, Burchenal Green; associate editors Louise Etra and Trish Todd; editorial assistant Jennifer Burr and art director Sandra Sax felt quite left out. Indeed of our total staff of 39, 19 are women, about as close to a 50-50 balance as you can get.

I took the photo shown below in Berkeley, California. You haven't made any visits there lately, have you?—John.

UNITED STATES OLYMPIC COMMITTEE
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What every educator should know about desk-top computers.

It's easy to get into classroom computing. What's tough is to do it right. With so much talk about computers in the classroom, educators like yourself want all the facts before they recommend any system for classroom use. That's why Apple Computer's new "Curriculum Materials Kit" can help, with answers to your questions and some very important data you may not have considered before.

Who uses desk-top computers.

Hundreds of innovative educators have already discovered the Apple Computer for instructional applications from kindergarten through college. Apple gives you computer-assisted instruction capabilities, including drill and practice, tutorial, problem-solving, games, simulations, and more. Apple engages student interest with sound and color video. In fact, your students will be able to write programs and create high-resolution graphics. And you can use your Apple for testing, counseling, even classroom data processing. That's just the beginning.

What to look for.

Once you've unlocked the power of the desk-top computer, you'll be using Apple in ways you never dreamed of. That's when the capabilities of the computer you recommend will really count. You don't want to be limited by the availability of pre-programmed cartridges. You'll want a computer, like Apple, that you can also program yourself. You don't want to settle for a black and white display that limits you to just putting words and numbers onto the screen. You'll want a computer, like Apple, that can turn any color tv into a dazzling array of color graphics.* The more you and your students learn about computers, the more your imagination will demand. So you'll want a computer that can grow with you as your skills and experience grow. Apple's the one.

How to learn more.

The quickest way to learn more about desk-top computers is to request your free copy of Apple's Curriculum Materials Kit (specify level). Get yours by calling 800/538-9696; in California, 408/996-1010. Or by writing us. Then visit your local Apple dealer. We'll give you his name and address when you call.

*Apple II plugs into any standard TV using an inexpensive modulator (not included).

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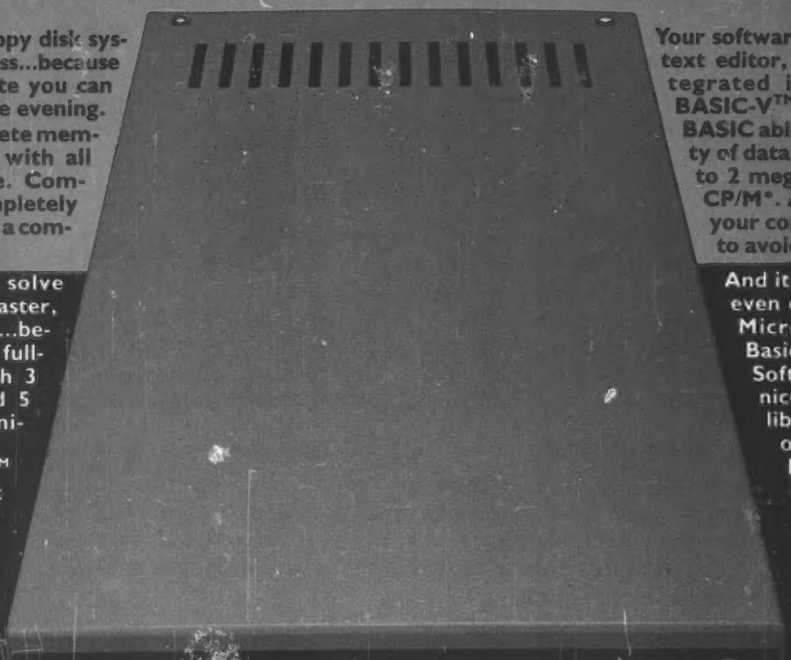

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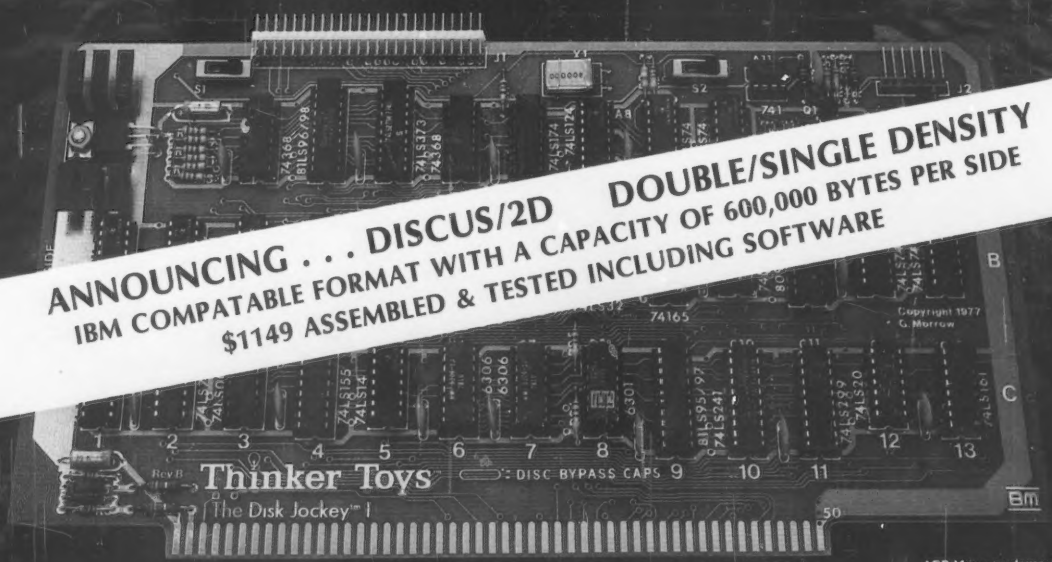

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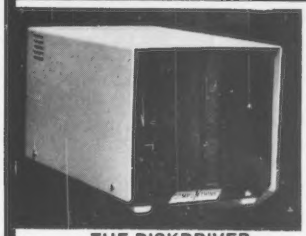

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ASG200	PET ASSEMBLER PROGRAMMER'S GUIDE (SHOWS HOW TO TAP INTO BASIC)	$19.95
ASM789D	PET ASSEMBLER 6502 PROGRAMMING SOFTWARE (ON DISK—WITH MANUAL)	$49.95
LNK456D	AUTOLINK PROFESSIONAL LINKING LOADER SOFTWARE (ON DISK—WITH MANUAL)	$49.95
EDT392D	ASSEMBLER-EDITOR, ASSEMBLER SOURCE PROGRAM EDITOR (ON DISK—WITH MANUAL)	$49.95
DUG078	DISKMON USER'S GUIDE (PROVIDED WITH SYSTEM—CAN BE PURCHASED SEPARATELY)	$ 9.95
DKL067	DISKMON (DOS) ASSEMBLER LISTING IN MANUAL FORM	$19.95
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Free Tournament

A challenging project for your strategic instincts and your programming skills may be this free computer tournament based on a nifty little game called the Prisoner's Dilemma. In the Prisoner's Dilemma there are two players. Unlike most games, such as chess, the two players are not in total conflict. In fact, both can do well or both can do poorly.

The game will be played for an average of 200 moves, and in each move, each player can choose either to cooperate or to defect. If both cooperate, both do well. But if one defects while the other cooperates, the defecting player gets his highest payoff, and the cooperating player gets taken for a sucker and gets his lowest payoff. The catch is that if both defect, both do poorly.

To win the tournament you have to get the highest total score summed over all the games you play. Therefore your object is to get a good score in each separate game, but *not necessarily* to get a better score than the player with whom you are currently playing.

To join the computer tournament you submit a program written in BASIC or FORTRAN IV which will be a decision rule for the selection of the cooperative or the defecting choice at each move. The decision rule may be based on the history of the game so far. For example, a simple and pretty effective decision rule is TIT FOR TAT: cooperate on the first move, and then do exactly what the other player did on the previous move.

Quite sophisticated decision rules can be written in as little as 25 lines.

This tournament is part of a research project to understand the nature of skillful performance in a two-sided environment which is partially cooperative and partially competitive.

Each person who completes an entry will receive a report describing the results of the tournament. The winner will receive a handsome engraved trophy.

To get further details on the tournament, write to Professor Robert Axelrod, Institute of Public Policy Studies, The University of Michigan, 506 E. Liberty St., Ann Arbor, Michigan 48104.

Our Face is Red Department

Our flash report in the Nov/Dec issue, pg 32 on DG's agreement with NEC was partially incorrect. It is a joint marketing agreement only and not a purchase of NEC by DG as reported.

Space Available Now!

A recent advertisement in *Science News* from Surge Corporation offers space on the Space Shuttle for as little as $200. The ad promises the opportunity to "prove your product in a severe environment develop original processing techniques, or evaluate equipment and experiments."

But why not use a portion of the space to put some art into space questions Peter Payack, a widely-published poet and writer? What would be more appropriate than calling this project "Space(d out) Art?" At the moment the art is shaping up to be an artificial moon filled with "imaginative, appropriate objects." One thing Peter and I discussed was that instead of integrated circuit chips, we should put in some chocolate chips. Maybe even some chocolate chip cookies and milk for whatever extraterrestrial beings happen to be around. If you have any ideas for Peter, write him at 64 Highland Ave., Cambridge, MA 02139. Incidentally, I recently spent an evening with Peter and he remarked that his poems got a more enthusiastic response from the readers of *Creative Computing* than most of the literary and poetry magazines put together.

If you want more information on space on the shuttle, write or call Surge Corporation, Box 922, Palestine, TX 75801.

Author's Guide

For budding contributors of articles, programs or other materials to Creative Computing magazine; manuscripts to Creative Computing Press; or programs to Creative Computing Software a 6-page Author's Guide is available. For your free copy, send a self-addressed stamped envelope. Contains 15 "Rules of Grammar" stated in a delightfully entertaining way.

COMING SOON!

Upcoming issues of Creative Computing will focus on the following subject areas. We are seeking high quality articles, programs, and other material for these issues. (For our free Author's Guide, send a self-addressed stamped envelope.)

Issue Date	Article due Date	Subject
March	Dec 15, 1978	Data base and file management systems
April	Jan 15, 1979	Home applications of all kinds
May	Feb 15, 1979	Word processing and text editing

ACM Elementary and Secondary Schools Subcommittee Seeks Participants

The recently formed Elementary and Secondary Schools Subcommittee of the Association for Computing Machinery is seeking participants to help foster and guide the study of and instructional use of computers at the elementary and secondary school levels. Among the tasks which the subcommittee has set for itself are:

(1) To develop specific and detailed recommendations for computer related content to be taught at the precollege level,

(2) To develop specific and detailed recommendations on teacher training, and

(3) To address the topic of deciding what microcomputer facilities can help meet school needs.

David Moursund, Committee Chairman, has indicated three ways to participate in the work of this committee:

1. *Passively.* Send your name, address, and a brief description of your involvement in the computer education field to the chairman. You will be put on a mailing list to receive copies of the documents produced by the committee.
2. *Actively, via correspondence.* Write a description of one or more of the major problems you would like the committee to work on. Suggest what the committee might do, and how you are willing to help. Your thoughts on the three tasks listed above and how these problems are being solved in your school, school district or state would be appreciated.
3. *Actively, via correspondence and attending meetings.* The committee will meet during the ACM Conference December 4-6 in Washington, DC. It will also meet during the Computer Science Conference February 20-23, 1979 in Dayton, Ohio and will meet during the National Computer Conference, June 4-7, 1979 in New York.

Persons who are interested in participating should communicate their ideas in writing to:

Dr. David Moursund
Dept. of Computer Science
University of Oregon
Eugene, Oregon 97403

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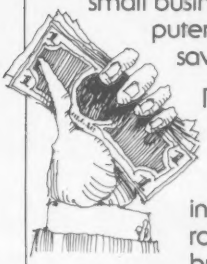

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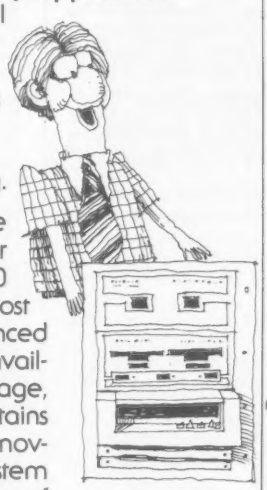

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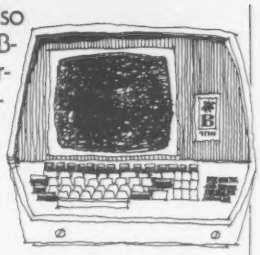
The System 12 also employs a Beehive B-100 video display terminal and a Centronics 779 high speed printer. The entire system is housed in a single compact desk unit.



Small Computers for Big Jobs

MSI is a leader in the development of small computer systems for business. The new System 12 has the power and capacity to perform as well as many of the other larger computer systems . . . but at a much lower cost.

If your business is in need of a new or advanced data processing system, call or write for detailed literature and the name of the System 12 representative nearest you.

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National Educational Network

EDUCOM, a nonprofit organization committed to interuniversity resource sharing, announced the unveiling of EDUNET — a national computer service network established to meet computing needs in higher education and research. The announcement came at EDUCOM's annual Fall Conference held November 14-16 at the Mayflower Hotel in Washington, on the theme of "The Reality of National Computer Networking for Higher Education."

Heralding the coming of EDUNET, EDUCOM President James Emery stated in his opening remarks, "The time for national networking among colleges and universities has arrived. By opening the door to the outside world of academic computing, EDUNET substantially expands the options available to students, professors, and researchers throughout the U.S."

In addition, as part of the three full days of in-depth seminars, speeches, workshops and exhibits, participants were able to gain hands-on experience with the specialized hardware and software resources available at EDUNET's fifteen supplier institutions. This opportunity came during an EDUNET Resource Rally in which demonstrations were given of some of the more than 500 resources appropriate for research and instruction in virtually every college discipline. Current sources of EDUNET supply include the computing facilities at Dartmouth, Cornell, University of Illinois, MIT, three Michigan universities participating in the Merit Computer Network, University of Minnesota, SUNY at Albany, University of North Carolina, Notre Dame, Rice, Stanford, University of Wisconsin and Yale.

EDUNET represents the association of these suppliers in addition to the more than 60 institutions that have already used EDUNET resources during its two-year prototype operation. The Princeton-based central staff, working with appointed liaisons at supplier schools, facilitates such use by collecting and disseminating resource information, handling accounts, arranging for communications access, and providing remote user support.

For more information write Rodney Mebane, EDUCOM, P.O. Box 364, Princeton, NJ 08540. Telephone (609) 921-7575.

COLLECTOR'S ITEMS!

Creative Computing has taken over *Computer Notes* (MITS' excellent hobbyist computer magazine). As part of our arrangement, we have a very limited stock of back issues of *Computer Notes*. "Very Limited" means what it says — we have 18 sets of twenty of the twenty-six issues published, and between 2 and 13 copies of each of the other six issues.

Our amazing offer: we will send 21 different issues of *Computer Notes* postpaid to the first 18 people who send in a check for $15.

We have somewhat larger stocks of the Nov. '77 and Jan '78 issues — $2.00 gets you these two plus one other of our choosing. (Nov '77 has articles about practical programming, a letter-writing program, Star Trek with sound effects, string character editing, a mastermind game and more. Jan '78 has articles on disk BASIC, Altair clock mods, a BASIC memory test, machine language to BASIC converter program and more.)

We also have a very limited stock of the August 1977 issue of **Microcomputer (SCCS) Interface.** It contained a discussion of a possible national computer club, a review of the SOL-20, seventeen short benchmark programs to compare different Basic features, construction hints and more. Cover price was $1.50 but we're letting them go for the ridiculously low price of $1.25 postpaid.

Uncovered in preparation for our move to new quarters were several cartons of the **Sep/Oct '76 issue of Creative Computing.** Our last issue on newsprint, it featured six pieces on computer generated poetry including three do-it-yourself programs. Also had articles on Russian computing, computers in elections, hints for running computer programming contests, two fantastic stories, many neat problems, puzzles and programming techniques. A bargain at $2.00 postpaid.

Last but not least, we found a carton of the **Mar/Apr '76 issue of Creative Computing.** This was our incredibly popular issue on artificial intelligence and future computing technology. It had an article on the SMALLTALK language, three great games and the classic story "Computers Don't Argue" by Gordon Dickson. We need the space so we're letting these go for only $2.00 postpaid.

Also, don't forget we're offering complete sets of all **nine issues of ROM** for the low price of $14. And if you've missed any of the 1977 or 1978 issues of Creative, they're all available (at least for now). You'll find an ad for these elsewhere in this issue.

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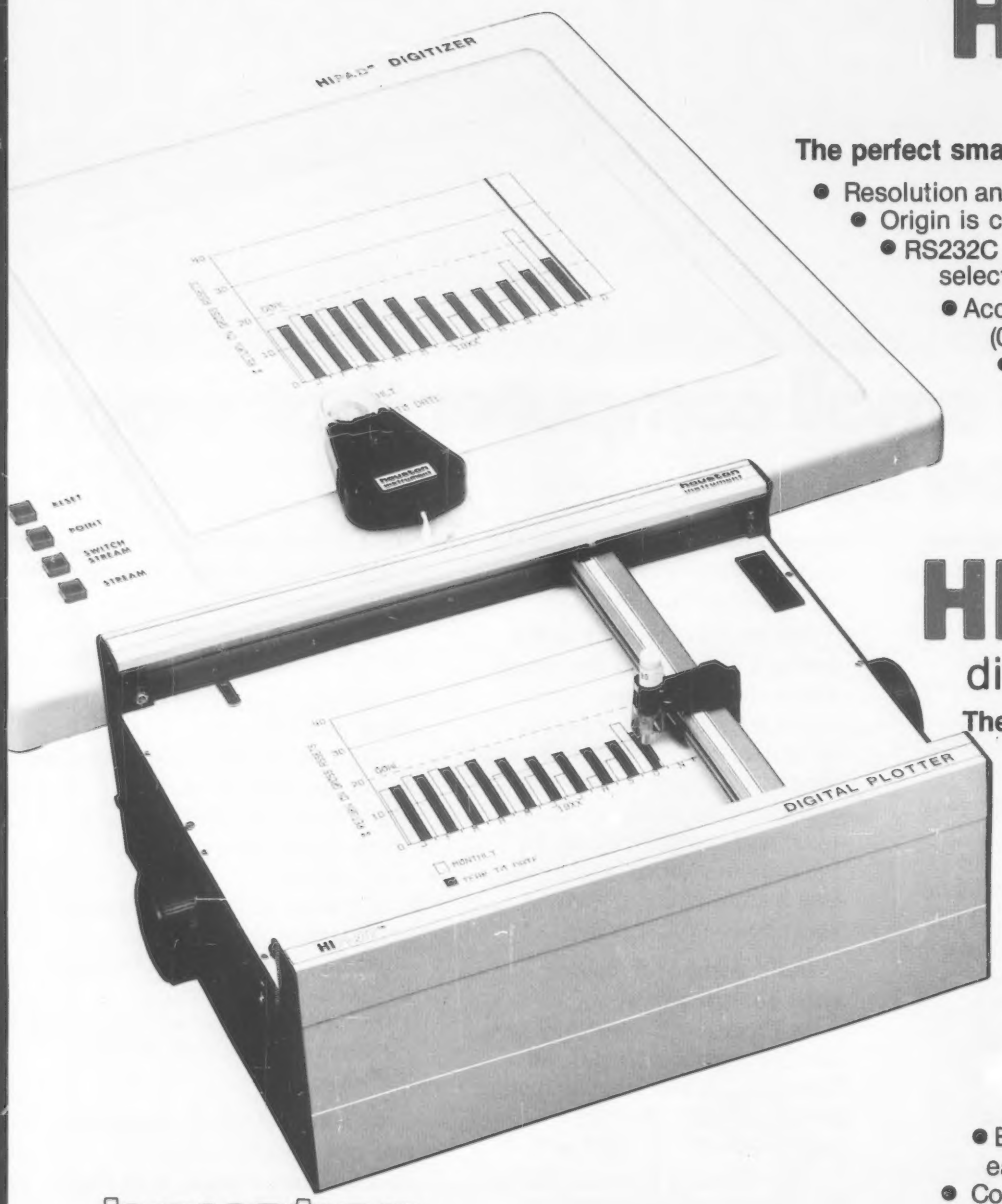

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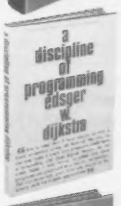

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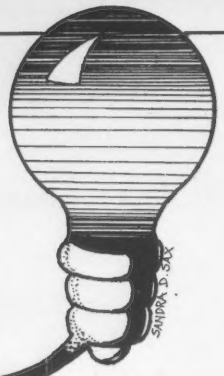

We welcome entries from readers for the "Compleat Computer Catalogue" on any item related, even distantly, to computers. Please include the name of the item, a brief evaluative description, price, and complete source data. If it is an item you obtained over one year ago, please check with the source to make sure it is still available at the quoted price.

Send contributions to "The Compleat Computer Catalogue," *Creative Computing*, P.O. Box 789-M, Morristown, NJ 07960.

MAGAZINES, JOURNALS

PRIVACY

PRIVACY JOURNAL has published its annual *Compilation of State and Federal Privacy Laws*, listing more than 30 new laws in the past 12 months that protect the confidentiality of personal information.

The *Compilation* describes and cites more than 400 state and federal laws that regulate recordkeeping about individuals—criminal information, financial and tax records, school records, government data banks, Social Security numbers and medical files. The 166-page book also lists laws on wiretapping and polygraphing.

The book is available for $14.50 from PRIVACY JOURNAL, P.O. Box 8844, Washington, D.C. 20003.

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VENDOR LITERATURE

CUSTOMER NEWSLETTER FROM IMSAI

The IMSAlder, a customer newsletter from IMSAI Manufacturing Corporation, is now a bimonthly publication in a new glossy magazine format. Its purpose is: in the words of General Manager Wesley Dehn, "To establish communication with all the people who purchased (IMSAI) equipment, (and) as the capabilities, the usefulness and the performance of our product are improved or expanded, to make that information available." To customers, it is available by subscription at $4.00 per year.

For further information contact: Barbara Otto, IMSAI Manufacturing Corporation, 14860 Wicks Blvd., San Leandro, Ca. 94577, (415) 483-2093.

CIRCLE 203 ON READER SERVICE CARD

NEW BYTE SHOPPER AVAILABLE

The new Spring, 1978, edition of the BYTE SHOPPER, a unique guide to the fascinating world of personal computing, is now available through MicroAge. In keeping with microcomputer industry trends, the new edition provides the reader with a complete key to computer system selection, and a guide to disk drive selection. New sections focus on systems designed specifically for business applications.

Recognizing the need for education, the BYTE SHOPPER is also an introductory text to personal computing, providing a glossary of computer buzzwords, and graphic visualizations of how microcomputers work and where they can be useful.

Expanded to 72 pages it has a complete description of microcomputer systems, decision-oriented charts and graphs, introductory text on personal computers, over 120 manufacturers and over 500 products represented, large 11" x 14" format. Price is $3.95 (includes postage & handling).

For more information contact: W. Craig Tenney, MicroAge, 1425 W. 12th Place, #101, Tempe, AZ 85281, (602) 967-1421.

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MASTER LIST OF COMPUTER BOOKS

The "MASTER LIST OF COMPUTER BOOKS" is a new catalog containing over 125 computer-related titles, with summary and price, from over 15 publishers. The catalog is divided into five sections: Section I—Introduction to Computers (16 titles); Section II — Microprocessors/Microcomputers (46 titles); Section III — Hardware (30 titles); Section IV — Software — Machine and Assembly Language (13 titles); Section V — Software—BASIC (21 titles). The catalog is available for only $1.50 postpaid. ($3.00 International).

The Computer Bookstore, 796 Navy Street, Fort Walton Beach, FL 32548.

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PERIPHERALS

APPLE ANNOUNCES DISK II

Apple Computer, Inc. today announed Disk II, the newest intelligent peripheral for its popular Apple II personal computer. The new device is the easiest to use, lowest priced, and the fastest minifloppy disk drive yet offered by any personal computer manufacturer.

Disk II's rapid access to programs and data makes home applications, such as personal finance easier; for example, a user can store a year's worth of financial records in one place and sort them quickly. Likewise, a week's worth of stock prices on the New York Stock Exchange can be stored and processed on a single diskette. Moreover, Disk II allows the Apple II to handle a wide

range of business applications including inventory, general ledger, payroll, etc. Each of these functions is made possible because Disk II permits rapid storage and retrieval of large quantities of information.

The Disk II subsystem consists of an intelligent interface card and either one or two mini-floppy drives. The computer will handle up to seven controller cards and fourteen drives for instant access to more than 1.6 million bytes of data. The combination of a bootstrap loader in ROM (read only memory) and an operating system in RAM provides powerful disk handling capability with the following features:

*Full disk capability for systems with as little as 16K bytes of RAM

*The ability to load and store files by name

*Random and sequential access

*Automatically generated file-name directories (catalog detailing diskette contents for each diskette)

*Storage capacity of 116 kilobytes per diskette

*Ability to be driven from Appli II power supply with no other power required

*Unique patented design that reduces power consumption and motor wear while permitting the drive mechanics to operate at higher speed.

The measures of Disk II's performance are summarized below:

Parameter: Disk Capacity; Data transfer rate; Track access time.

Specification: 116K bytes (soft-sectored format); 156K bits/second (19.5K bytes/second); 200 milliseconds average; 600 milliseconds maximum.

Disk II will begin shipping in June 1978 at an introductory price of $495. This price includes both controller card and Disk II Drive.

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E&L INSTRUMENTS VTE-1™ VIDEO TERMINAL

Used with a television set or monitor, the VTE-1 Video Terminal Electronics system provides a full ASCII keyboard, reprogrammable character generator, cursor and flicker-free refresh. Full duplex and local operation are possible, with RS232C and 20 mA current loop interfaces operating at speeds of 75 to 9600 baud.

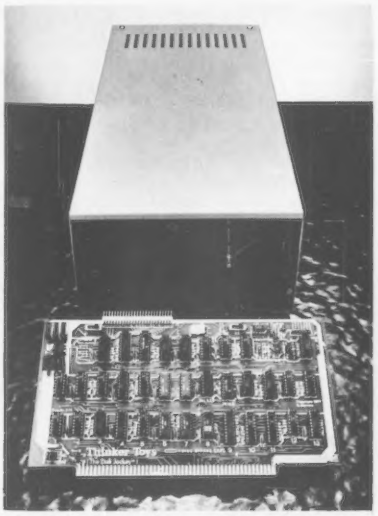
The standard character set contains 64 upper case alphanumeric ASCII characters. Lower case is optional, and the character generator is user-reprogrammable to provide any user defined 5x7 dot matrix characters. The 128 character ASCII decoder supplied is also user-reprogrammable to accommodate alternate character codes or code sets.

The blinking full field cursor can be directly positioned in any screen location, or turned off for a clean graphic display. A nondestructive read screen function transmits the ASCII code for the character at the cursor position to the user, with automatic spacing. Other features include clear screen, bell code and wrap-around.

The VTE-1 provides a 75 ohm composite video output that will directly drive any U.S. compatible black and white television monitor, or the optional MON-1 monitor available from E&L. Standard TV sets may be connected through readily available VHF converters, or modified by qualified servicemen to provide a direct video input connection.

List price of the VTE-1 is $600.00 fully assembled, or $450.00 in kit form. Optional MON-1 monitor (assembled only) is priced at $210.00. E&L Instruments, 61 First St., Derby, CT 06418, (203) 735-8774.

CIRCLE 207 ON READER SERVICE CARD



DISCUS I™ FULL-SIZE FLOPPY DISK COMPLETELY ASSEMBLED AT $995

Morrow's Micro-Stuff/Thinker Toys is delivering the new DISCUS I full-size floppy disk memory for S-100/8080 microprocessor systems.

The DISCUS I system is sold as a complete system, completely assembled and tested, with all required hardware and software, for $995 (plus tax and handling).

Hardware included in the DISCUS I system includes a Shugart 800R full-size disk drive fully mounted in a custom, all-metal cabinet with an independent power supply, a Disk Jockey I™ S-100 controller with a capacity for seven additional disk drives, and all necessary cables and connectors.

The controller offers an extraordinary convenience: an on-board serial I/O port to which all system software has been interfaced. This allows the system to be simply unpacked, plugged in and brought up immediately. The I/O routines can then be modified with the included system software at the user's convenience.

Software included in the DISCUS I base price features an integrated DISK/ATE™ system containing most utilities: Disk Operating System, File Management, System Debugger, Text Editor, Batch Processor and 8080 assembler.

Also included in the base price is BASIC-V™, a virtual disk BASIC with the ability to address up to two megabytes, and to accommodate a wide variety of data types including string-oriented arrays with an unlimited number of dimensions. BASIC-V will be delivered in late summer 1978.

Also included are patches for CP/M™.

For users wishing to supplement the DISCUS I software, several extra-cost options are available. CP/M™ for Digital Research is available for $70. Microsoft Extended Disk BASIC ($199) and Disk FORTRAN ($349) are also available.

Memory products designed and manufactured by Thinker Toys now includes the DISCUS I™ full-size floppy disk, Disk Jockey I™ universal S-100 disk controller, SupeRam™ 32K and SupeRam 16K static memories, and SynchroFresh™ 8K dynamic memory.

For further information: Neila Richmond, Thinker Toys, 1201 10th Street, Berkeley, CA 94710, (415) 524-5317.

CIRCLE 208 ON READER SERVICE CARD

THE "NO-FRILLS" TERMINAL

Computer Peripheral Corporation has announced the introduction of a "no-frills" marketing approach unique to the computer terminal industry. The COPS 10 and the COPS 20 computer terminals, which offer all standard design and performance features, will be sold directly to the user at a substantial cost savings under the new marketing plan.

The COPS 10 and COPS 20 terminal designs offer all standard features among them a detachable upper/lower case typewriter style keyboard; switch selectable upper/lower case; 12 inch non-glare screen; cursor control keys and direct X-Y cursor addressing; transparent/tape mode; and several special features such as reverse video by character and buffered keyboard transmission.

Another positive marketing feature for the

COPS "no-frills" display terminals is emulation. Computer Peripherals Corp. offers emulators for the Hazeltine 1510 and the DEC VT52.

The COPS 10 "no-frills" terminal is being offered at a cost of $750. Currently, there is a thirty day delivery on units ordered.

Contact Computer Peripherals, 1225 Connecticut Avenue, Bridgeport, CT 06607, (203) 333-8339.

CIRCLE 209 ON READER SERVICE CARD

NCC ENHANCES MODEL 43 TELETYPE

Added value at reduced cost is the advantage National Computer Communications delivers to prospects for Teletype's Model 43, 30 cps, matrix teleprinter. Called NCC 1043, the basic product offers Model 43 performance, features and options, but as discounted prices of $965 per unit. An NCC 1043II version includes NCC's Bell-compatible AC103 modem attachment. EIA RS232C or current loop interfaces are available.

For more information contact: William F. Tilley, President, National Computer Communications Corp., 171 Worcester Road, Wellesley Hills, MA 02181, (617) 235-7055; or Robert M. Loonin, CEO, National Computer Communications Corp., 26 Sixth Street, Stamford, CT 06905, (203) 325-3831 or (800) 243-9006.

CIRCLE 210 ON READER SERVICE CARD

HARDWARE

COMPUTER JUGGLES MANY TASKS

S-100 computers can handle simultaneous problems when outfitted with the MULTITASKER, an interrupt handling board from Objective Design, Inc. Having interrupts in the system allows one computer to do the work of many. For example, with an interrupt driven system you can: handle program development on several terminals at once; run household appliances and play games at the same time; and continue using the computer while a slow printer is churning out a listing.

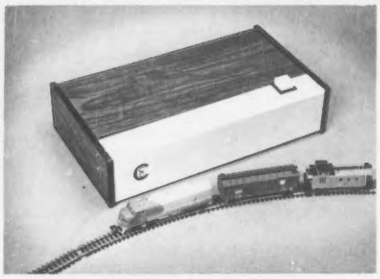
Unlike less sophisticated interrupt boards, the MULTITASKER does not use forced 'RESTART' instructions—which tie up the near-zero address space. It can be located anywhere in memory—and will generate 'CALL' vectors to any location. The complex assembly language software required for handling interrupts is available on PROM (which goes into space provided on the board), making the interface into a high level language relatively easy.

Another MULTITASKER board option is a crystal derived Real Time Clock. Timed interrupt intervals are hardware selectable from 100 microseconds to 100 milliseconds. Software counters can extend this time into days or years.

MULTITASKER without PROM in kit form is $205.95. Shipping costs are $5.00 Canada; $20.00 overseas.

Objective Design, P.O. Box 20325, Tallahassee, FL 32304, (904) 224-5545.

CIRCLE 211 ON READER SERVICE CARD



UNIVERSAL INTERFACE CONTROLS EXOTIC PERIPHERALS

A single RS-16-H, requiring one parallel I/O port, can be used to control many different peripheral devices as directed by a microcomputer. The device provides all electronics needed to drive 16 outputs (relays, motors, lamps, solenoids) and sense 16 to 24 inputs (TTL or switch contacts, including magnetic reed switches) with all inputs and outputs brought to a 44 pin edge connector. If the interface ever fails, a special diagnostic connector can be substituted. Failed ICs can then be found and replaced using the diagnostic BASIC program provided, without need for factory repair.

Each output line can be individually set or cleared using BASIC, machine code, or other language by means of I/O read or write commands. A special command (or the manual reset button) can be used to clear all outputs simultaneously. If desired, simple switches can be wired to allow manual override of the computer's commands.

Since all peripheral device inputs and outputs pass through an edge connector, electric trains, stereos, burglar alarms or other devices can be wired to individual connectors and the RS-16-H can be plugged into any one of these.

Completely assembled and tested with handsome case, sample BASIC programs and installation manual at $229. The installation manual alone is $5, and can be applied toward purchase for 90 days. Cooper Computing, P.O. Box 16082, Clayton, MO 63105.

CIRCLE 212 ON READER SERVICE CARD

SOFTWARE

FM-11 FILE MANAGEMENT SYSTEM

MultiCept Corporation announces the FORTRAN-compatible FM-11 file management package for the DEC RT-11 operating system. As a replacement for FORTRAN file I/O or as an additional capability for FORTRAN or MACRO applications, FM-11 supplies the programmer with a powerful data base organizational facility that supports sequential, random access and hierarchical chained (Codasyl-like) data structures on any random access device.

FM-11 allows preallocation of file space completely under programmer control, and performs all maintenance functions for inserting or deleting records in a sequential (e.g., indexed) file. FM-11 is most at home in highly sophisticated data base applications and provides multiuser file interlock, multiple owner record linkage and a complete access/update function group for associated records in a chained structure.

The package is now available as a user library or integrated into a licensed RT-11 operating system. Priced between $495 and $895, depending upon configuration and distribution medium.

For more information contact: MultiCept Corporation, 201 West Pine Street, Rome, N.Y. 13440 (315) 337-1000

CIRCLE 213 ON READER SERVICE CARD

MITS 88006 TELECOMMUNICATION SYSTEM

The Microware-PBS has announced a telecommunication system for the MITS Altair 8800b microcomputer. This system enables the MITS 8800b to be used as an intelligent terminal in two way communication with a remote time sharing device over the telephone lines using an acoustic coupler.

The telecommunication system consists of an assembly language routine and another program written in MITS disk extended Basic. Control commands are provided to enable the operator to switch command console communication from the remote device to MITS and vice versa. This system may be used to communicate and transfer any kind of data files to and from a remote time sharing device at speeds up to 300 baud. The hardware requirements are MITS 8800b with 32K core memory and one or more floppy disks. It is supplied on an 8" floppy disk with an 18 page User's Manual. The system is priced at $195.00 which includes the source listing. The User's Manual may be purchased separately for $20.00 for system evaluation and its cost may be applied towards the purchase of the telecommunication system at a later date.

For more information contact: Mr. Mark Shelton, Microware-PBS, P.O. Box 47, Blacksburg, VA 24060.

CIRCLE 214 ON READER SERVICE CARD

CP/M MACRO PACKAGE

Structured Analysis Systems has developed SP80, a set of structured programming macros for the 8080/Z80. Macro libraries are available for the TDL Z80 assembler V2.2 and the Intel macro standard. SP80 provides all common structured programming consructs; DO for count iteration, IF-ELSE for two path conditions, SELECT-CASE for multiple path branching, REPEAT-UNTIL and WHILE loop constructs as well as a special LOOP-EXITIF-ENDLOOP which allows multiple exits from imbedded loops. All constructs

the $988 Surprise . . .

If you haven't looked carefully at the Level-II 16K TRS-80, you're in for a big surprise! Level-II BASIC gives TRS-80 advanced features like comprehensive string handling, multi-dimension arrays, multi-letter variable names, named cassette files, full editing, integer arithmetic, single (6-digit) and double (16-digit) precision arithmetic, formatted printing, memory-mapped video (print directly at any of 1024 screen positions), 128x48 video graphics (may be intermixed with text), error trapping, auto line numbering, TRACE, PEEK and POKE . . . to name just a few. Because Level-II is in ROM, TRS-80 powers-up ready to go with the full 16K RAM available for your use.

This means TRS-80's memory is equivalent to a 28K RAM-based system.

New for 1979—TRS-80's numeric (calculator) keypad included on every 16K computer, and available as an add-on for present owners.

TRS-80's modular design allows easy expansion. Add up to 48K RAM, Expansion Interface, printers, 1 to 4 Mini-Disks, RS232C, telephone acoustic couplers, Voice Synthesizer, dual cassette recorders, our System Desk and Printer Stand. Surprisingly, these are not promises of things to come, but real products being delivered right now. Software from games to General Ledger are available, with more cassette and disk software being added monthly.

Radio Shack's 58 years of consumer electronics leadership, our 50 regional repair centers (growing to 100 this year), our new Radio Shack computer centers, and our NYSE-listed billion-dollar parent, Tandy Corporation, insure that customer support is always available right where it should be—locally.

So if you haven't seriously looked at TRS-80 yet, ask your local Radio Shack for our new 20-page fact-filled catalog and be prepared for a $988 surprise. Surprising power—features—price—support! Level-II 16K systems include everything pictured, plus the manual. Better to be surprised now . . . before you choose the wrong microcomputer system.

allow signed and unsigned relational tests (EQ, NE, LE, LT, GE, GT) and condition code testing. Available with the TDL version is the use of conjunction (AND) and disjunction (OR) in any construct.

As an example, to find the first non-numeric in an input buffer, the following SP80 code could be used. The code requires 19 bytes and has an average loop execution time of 46 T-states (23 microseconds).

```
LXI H,BUF, ;LOAD START OF BUFFER
LOOP
MOV A,M; GET MEXTCHARACTER
EXITIF. A, GT, 39H, OR,. A, LE, 2FH EXIT IF A NOT ASCII 0-9
INX H; CHECK NEXT CHARACTER
ENDLOOP
```

Why use structured programming macros for microprocessor assembly programming? Faster program development; easier maintenance; self documenting code; same SP80 program can be used with Z80 or 8080 macros; reduced learning time; reduced debugging time; shorter program listings; efficient programs; no software required other than your macro assembler.

A manual containing listings of all macros in the two libraries, a discussion of macro syntax, constraints, memory and execution time requirements, a detailed example with corresponding conventional program, and general notes and suggestions is available for $19. A diskette containing the macro libraries is available for $19 in CP/M file format.

Structured Analysis Systems, P.O. Box 2745, Reston, VA 22091.

CIRCLE 215 ON READER SERVICE CARD

MICRO BUSINESS SOFTWARE

Designed to run on an 8080 processor these business programs are coded in FORTRAN and are therefore not hampered by the overhead of an interpreter.

The General Ledger was designed for CPA's and is thus very generalized and flexible. There are over twenty programs in the system. It allows up to 200 accounts, with 9 levels of totals, percentages (current and YTD) on P&L, capabilities for run time selection of detail on the P&L and Balance Sheet, forces balanced entry of transactions, verifies accounts are valid, automatically puts I/E totals in Balance Sheet, and many more features that you would expect on a large computer.

Payroll prints checks, calculates multi-state taxes, local taxes, handles multi-pay periods, bonuses, salaried and hourly employees, W2's, 941's, check register, department reporting, hand written checks can be entered, check numbers and tax tables can be changed by users, and other features.

Accounts Receivable and Accounts Payable are under development with Job Costing for Payroll planned. Available for CP/M with G/L also currently available under ISIS.

G/L, P/R (object code) $775 each; A/R, A/P $495 each, or all four for $2250. Users manuals $15 with credit towards purchase of software.

Arkansas Systems, Inc., 8901 Kanis Road, Little Rock, AR 72205, (501) 227-8885.

CIRCLE 216 ON READER SERVICE CARD

WORD PROCESSING SOFTWARE

Promedics Data Corporation, a turnkey computer system and software company, has announced a Word Processing System for professional applications. The software is very flexible in nature and has features found only on larger more expensive computers. These features include disk storage of files, automatic date insertion, global search and replacement, block text move or copy, bell warning at end of line, ruler option, automatic centering, underlining, cursor backspace and erase, automatic new line generation, paging and multifile concatenation.

The software is written in BASIC and runs on any system supporting a BASIC compiler and interpreter. The software is currently running under the CP/M operating system and under RSX-11M with BASIC+2. The software is available to both end users and OEMs. The single user license fee is $750 or a complete turnkey system including general ledger and accounts receivable is available for $13,500.

For further information contact Promedics Data Corporation, 1032 Elwell Ct., Suite 240, Palo Alto CA 94303.

CIRCLE 217 ON READER SERVICE CARD

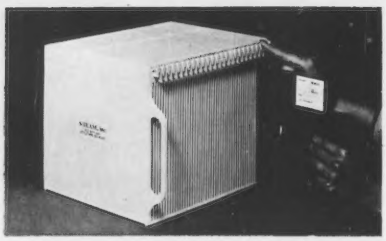
MISCELLANEOUS

NEW BATTERY WIRE WRAPPING TOOL

Model BW-520 battery tool is the newest member of the Wire wrapping tool family from OK Machine and Tool Corp. It is interchangeable with the previous model BW-515 and features improved indexing and drive mechanisms at no increase in price. Rated to accept bits for 22-30 AWG (0, 65-0, 25mm) wire, the tool operates on 2 standard C-size Ni Cad batteries and is constructed of high durability reinforced Lexan™. Also available with optional anti-overwrapping device as model BW-520-BF. The tool is also available in a reversing model BW-520-U for power unwrapping when equipped with a special unwrapping bit. The tool is reversed simply by flicking a switch located on top of the tool. The reversing version may also be equipped with the anti-overwrapping device as BW-520-BF-U. Prices start at $108.70 including batteries. In stock.

OK Machine & Tool Corporation, 3455 Conner Street, Bronx, NY 10475, (212) 994-6600.

CIRCLE 218 ON READER SERVICE CARD



FLOPPY DISK STORAGE SYSTEM

The FLOPPY DISK STORAGE SYSTEM (Pat.Pend.) insures data integrity by providing a safe environment for your diskettes from coffee spills, cigarette burns, creases, folds or a bad case of the bends.

The uniqueness of this design offers fully indexed, instantaneous, retrieval of your most frequently used diskettes through easy push button control.

SPECIFICATIONS AND PRICES: 15 slots – 4 lbs., 4¼"W x 9¾"H x 10½"D, $69.95; 30 slots – 8 lbs., 8"W x 9¾"H x 10½"D, $119.95; 50 slots – 13 lbs., 13"W x 9¾"H x 10½"D, $179.95.

MATERIAL: High Impact Plastic

COLOR: Eye Pleasing Beige

For further information contact: The A-Team, Inc., P.O. Box 719, Broomfield, CO 80020.

CIRCLE 219 ON READER SERVICE CARD

FLIPPY-DISK-KIT

Square 1 now makes a kit available that lets the user make "flippy" diskettes out of his "floppy" diskettes. Most diskette manufacturers coat and finish both sides of the diskettes, but package them in such a way that they are only usable on one side. With ordinary care, the user can modify the jacket of the diskette so the spare side can be used. Called the FLIPPY-DISK-KIT, it contains all the necessary tools to locate and accurately punch the extra holes in the jacket of the diskette. Instructions guide the user through the "anatomy" of a diskette explaining clearly the function of each hole and opening in the jacket, then the method of marking and punching the holes and testing the newly available side. Square 1 claims over 85 percent of the 5¼-inch diskettes can be successfully made usable on the "flip" side. The kit is designed to be used with North Star, Horizon, Polymorphic, Vectorgraphic, Vista, or any other 5¼-inch hard sectored mini-diskette drive. Once the user buys the kit, he then gets the use of both sides of every diskette he buys, thus in effect, getting a 50 percent discount on his disk purchases. The kit contains instructions, double sided "flippy-plate," a unique pencil for making highly visible marks on the black diskette jacket, and a specially ground and polished hand punch for making the holes. Priced at $9.95 plus $1.00 shipping.

Available from: Square 1, 614 Eighteenth Avenue, Menlo Park, CA 94025.

CIRCLE 220 ON READER SERVICE CARD

BEYOND TRS-80™

When Microsoft put Level II BASIC on TRS-80, you got a glimpse of its full potential.

Now Microsoft introduces:

TRS-80 Fortran

and TRS-80 will never be the same!

Plus

TRS-80 FORTRAN includes the finest Z-80 development software available:

Z-80 Macro Assembler, versatile Text Editor, and Linking Loader.

Total price: Only $350.00

TO: Microsoft, 10800 NE Eighth, Suite 819, Bellevue, WA 98004

☐ **Send me free TRS-80 FORTRAN overview.**

☐ **Send me TRS-80 FORTRAN and Z-80 development software for $350.00.**

☐ Check enclosed ☐ Master Charge ☐ VISA

Card Number _____ Exp. Date _____

Cardholder's Signature _____

Name _____

Address _____

City _____ State _____ Zip _____

Clip the coupon and ORDER NOW, or send for free overview for more details about TRS-80 FORTRAN.

TRS-80 FORTRAN is supplied on two minidiskettes and requires a 32K system with one disk drive. Dealer inquiries invited.

MICROSOFT

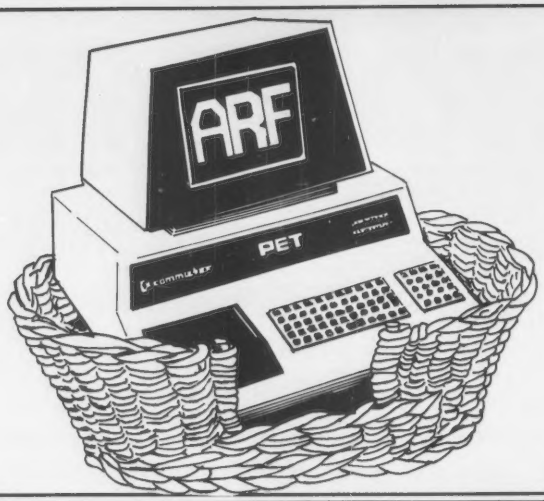
10800 NE Eighth, Suite 819
Bellevue, WA 98004

CIRCLE 147 ON READER SERVICE CARD

Personal Electronic Transactions

by Gregory Yob

I am happy to hear from you, and encourage your correspondence. I will try to acknowledge all correspondence, and a SASE makes things easier for both of us. Please send your letters to "Personal Electronic Transactions" c/o PO Box 354, Palo Alto, CA 94301.



Presently there is an incredible variety of hardware and software products on the market for the PET. Due to the void we all have experienced during the past year, there is a tendency to applaud every new product as really great. However, once something better arrives, often the earlier product is seen in a more realistic light. Unfortunately, some of you will be stuck with the earlier model.

There isn't much I can do about all this unless I make this column mostly reviews - which I won't do. When I see something especially good or bad, I will mention it to you.

A Plug and a Non-Plug

If you want to extend your PET's memory, along with several other options, my recommendation goes to: Expandapet by Convenience Living Systems, 648 Sheraton Drive, Sunnyvale, CA 94807 (408) 733-0688. If you give them an inquiry, mention this column.

If you are interested in the PET's ROM and what's inside it, several vendors are selling "PET ROM Disassemblies." I don't know of one that is worth more than the paper it comes on. The PET ROM includes many different things besides the 6502 code, and the disassemblies I have seen tend to ignore such small details.

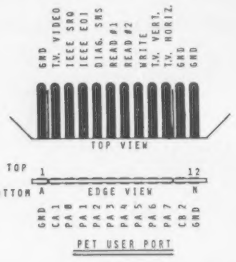
Some Data on the User Port

Many of you are in the situation of having a PET, and no information about the various ports on the rear. Figure 1 shows the pinouts and signals for the User Port, which is the middle connector in the back. We will be using this port for making PET noises and music.

PET Slave Video Display

Those of you in a teaching situation may have use for more than one display of the PET screen. A close look at the lines on the top of the User Port reveals several "TV" signals which may be combined to provide the composite video used by most television monitors. (Note: If you have an ordinary TV set, you must use a RF modulator, such as a Pixie-Verter, to make the composite video into a signal for your TV antenna input - get in touch with your TV repairman. If you try this, the picture will not come out very well - so try and find a monitor.)

FIGURE 1 PET USER PORT DIAGRAM & PINOUT INFORMATION

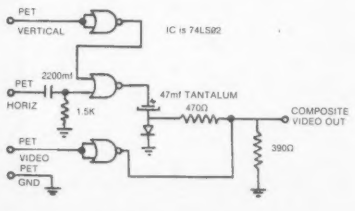


PINOUT INFORMATION (USER PORT)

12 positions with 24 contacts. 0.156" spacing. Keys between pins 1 and 2, and pins 10 and 11. (Finding this connector can be difficult - take a 22 position, 44 contact connector and a hacksaw and make your own. The leftover part fits nicely on the cassette port.)

TOP		BOTTOM	
1	Ground	A	Ground
2	TV Video	B	CA 1
3	IEEE SRQ	C	PA Ø
4	IEEE EOI	D	PA 1
5	Diagnostic Sense	E	PA 2
6	Tape Read # 1	F	PA 3
7	Tape Read # 2	H	PA 4
8	Tape Write	J	PA 5
9	TV Vertical Synch	K	PA 6
10	TV Horizontal Synch	L	PA 7
11	Ground	M	CB 2
12	Ground	N	Ground

FIGURE 2 COMPOSITE VIDEO MIXER FOR PET TO TV MONITOR



PET Video Mixer by Commodore Pet Users Club of England - Newsletter Issues 1 & 2, page 9

The simplest and cheapest circuit that does this is shown in Figure 2. The total cost is around $2.00. More than one monitor can be attached if required. The integrated circuit used is a 74LS02.

Exploring PET Random Numbers

There are many situations where you need random numbers — for example, games which roll dice or shuffle cards, simulations which vary starting conditions or have "acts of God" and so on. The PET has a function, RND, which will provide you with a random number with value between 0 and 1.

A quick way to see how the RND function works is to enter this program into your PET and RUN it:

```
10 INPUT R
20 PRINT RND (R)
30 GOTO 20
```

If you try a negative number, such as -2.987654, you will see the same value repeated on the screen. (In this case, you get .12782608) NOTE: The negative integers tend to give consistently small values, such as 4.20313882 E-08 for -45.

If you try zero, you will see values around .5 to .6, with .620111383 appearing about half the time.

If you try a positive number, the numbers will be different and seem to be random. If you want to see the numbers at a readable pace, press RVS to slow the display, or STOP to stop the program.

This gives us some rules for the PET RND function:

Rule 1: RND(negative number) will always give back the same value each time it is used with a particular number.

Rule 2: RND (0) doesn't work.
Rule 3: RND (positive number) gives random numbers.

Now turn off your PET and turn it on again. Then enter:

PRINT RND(5) .(or any positive integer)
.576189016

If you repeat this procedure, turning off the PET and printing a random number, you will get the same result—this gives us another rule:

Rule 4: PET always starts its random numbers from the same place when you turn on the power.

As you can see, this means if you come home from work, and want to pay a hand of poker with your PET, you will keep getting the same hand every day. To get around this, let's look at another thing:

Turn on your PET again, and obtain the first five random numbers.

.576189016
(Done with: FOR J=1 TO 5:?RND(5) :NEXT)
.306654204
.377004198
.739710661
.124558778

Now reset your PET again, and enter:

PRINT RND (-1.234)
.27232287
For J = 1 TO 4:PRINT RND(5); NEXT
.69531946
.593247651
.0105296875
.69904041

The sequence is now different! This leads to Rule 5:

Rule 5: RND(negative number) resets the random number generator at a new starting place determined by the negative number.

There is one trap to avoid with resetting the random number function. The best way to see it is to try this program:

```
10 INPUT P
20 P=RND(-P)
30 PRINT P
40 GOTO 20
```

When you RUN this, the results will not be random. Instead, two values will alternate with each value varying slightly each time. If some of you want to check the PET RND function further, I suggest the tests in Knuth's "The Art of Computer Programming, Seminumerical Algorithms, Vol 2" which can be found at most technical bookstores. Let's go on to some simple applications for RND.

If you want a number from 1 to whatever, use this expression:

INT(RND(1)*whatever)+1

For example, to throw a die, you would use INT(RND(1)*6)+1. Here is a dice-thrower for craps or monopoly:

```
10   PRINT   INT(RND(1)*6)+1+
INT(RND(1)*6)+1
  20 GOTO 10
```

It's handy to define a general purpose random function by:

DEF FNR(X)=INT(RND(1)*X)+1

If a range of numbers is desired, say from X to Y, the expression becomes:

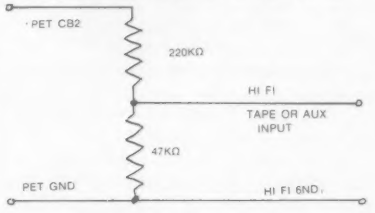
INT(RND(1)*(Y-X+1))+X

PET Sounds and Music

The PET arrives to you in a mute condition—giving it a voice is quite simple to do, and now you can play "music" or add some sound effects to your games or make an alarm clock or anything you can imagine that can use simple sounds.

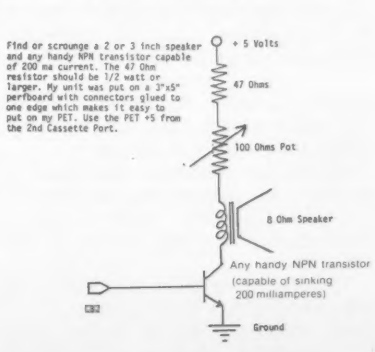
Figure 3 shows a very simple circuit that can be hooked to your stereo or other audio amplifier. If you want more freedom, use the device in Figure 4. I took a 3" x 5" perfboard, a 44-position edge connector and some epoxy glue to make mine. The edge connector was sawed into two pieces, one for the User Port, and one for the 2nd Cassette Port

FIGURE 3 VERY SIMPLE CIRCUIT FOR PET SOUND VIA CB2



Connect the output to a standard RCA plug & audio cable and hook to the Aux or Tape input of your sound system.

FIGURE 4 SELF CONTAINED PET SOUNDMAKER CIRCUIT


Find or scrounge a 2 or 3 inch speaker and any handy NPN transistor capable of 200 ma current. The 47 Ohm resistor should be 1/2 watt or larger. My unit was put on a 3"x5" perfboard with connectors glued to one edge which makes it easy to put on my PET. Use the PET +5 from the 2nd Cassette Port.
+ 5 Volts
47 Ohms
100 Ohms Pot
8 Ohm Speaker
Any handy NPN transistor (capable of sinking 200 milliamperes)
CB2
Ground

for power. When the connectors were hooked to the PET, I glued the perf-board onto the connectors, making a one-piece unit that's easy to hook up or remove.

If you use this unit, DON'T FORGET THE 47 OHM RESISTOR!! The +5 supply for the PET second cassette can only supply around 100mA and the speaker will appear to be a short circuit when the transistor is on. The 47 ohm resistor prevents the +5 supply from burning out!!

The PET sounds are made via the User Port line called CB2. This line is usable in several modes, two of which are good for making sounds. One warning: When you fool with CB2, you will usually remove the PET's ability to SAVE or LOAD tapes. To restore normal operation, use these statements:

POKE 59466,0:POKE 59467, 0:POKE 59468,12

So, when working with sound, SAVE on tape *before* you RUN the program.

Clicks

The User Port is controlled by 16 memory addresses in the PET. For musical purposes, four of these have meaning:

59464 Frequency Control
59466 Timbre Control
59467 Shift Register Mode Control
59468 Click Control

If you want to learn more about the other User Port addresses, get the MOS 6522 specification from MOS Technology.

The CB2 line is set high by the statement: POKE 59468, 224 and low by: POKE 59468,192. If you enter these lines on your PET, when you press RETURN you will hear a faint click from your speaker. To get another click, you must enter the opposite POKE, since changing high to high or low to low doesn't make a sound.

If you do this rapidly enough, you can get a buzz. Try:

FOR J=1 TO 1000:POKE 58468, 192: POKE 59468,224: NEXT

You will hear a buzz for about 20 seconds. The most rapid possible buzz can be made with:

A=59468:B=192: C=224: FOR-J=1TO1000:POKEA,B: POKEA, C:NEXT

This gives a 5 second buzz which will vary in tone. (The variance in tone comes from the fact that the FOR-NEXT loop changes in speed as J increases — the experimenters among you can try powers of two for the loop limit and see what happens.)

A "practical application" is to provide feedback when keys are pressed. Here is a little program that clicks for each key and makes a little buzz when RETURN is pressed:

```
10 GETA$:IFA$="" THEN 10     ("
```

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CIRCLE 187 ON READER SERVICE CARD

is a null string)
```
20 PRINT A$;
30 C=1: IF A$=CHR$ (13) THEN
   C=5    ( 13 is RETURN)
40 FOR J=1 TO C
50 POKE 59468,192
60 POKE 59468,224
70 NEXT J
80 GOTO 10
```
I leave you with the exercise of combining this with a false cursor and making a nice string input routine.

Tones

The CB2 line can be put into a "free-running" mode where it can make a tone while your BASIC program is doing other things—something your clicks program can't do. To make a tone, enter:
```
POKE 59467,16
POKE 59466,15
POKE 59464,200
```
You will now hear a tone in the octave below middle C. But! There's no end to this tone—to turn it off, use POKE 59466,0. Let's take a look at what these POKEs mean. First, the POKE 59467 puts the CB2 line into Shift Register Mode—this statement must be done *first*, or the others won't work. It needs to be done only once, however. The 59466 controls the timbre of the sound, with 0 or 255 making no sound at all. The PET is continually moving the bits in this address out the CB2 line, so all high or low will not provide any sound. Using the screen editor, try these variations on 59466:

1 and 254	sound the same.
1,2,4,8,16,128	sound the same
15	gives a "purer" sound
17	will be an octave higher
85	is 3 octaves higher

If you convert these values to binary, you can see why the above results happen. Now POKE 59466 back to 1, and change 59464 to 100:
```
POKE 59466,1:POKE 59464,100
```
The memory cell is 59465 controls the rate at which the PET shifts the timbre bits out. The value is a count-down, so the smaller the number, the higher the pitch. The highest pitch I can hear is the one at POKE 59464,3.

Those of you who want to play music should note that the frequency made by CB2 when 59466 is set to 15 is given by this formula:

Frequency = 1000000/16*(V+2))
where V

is what you POKE into 59464. Since the PET has a crystal clock, the stability of pitch is more than excellent.

Since I am running a little short of space, music playing programs will be covered in the next column. Meanwhile, let's do some sound effects.

The first thing to do is to sweep the frequency with a loop like this:
```
10 POKE 59467,16    (set CB2
   mode)
20 POKE 59466, 15    (Timbre to
   square wave)
30 FOR F= 200 TO 10 STEP -1
40 POKE 59464,F     (Set freq)
50 NEXT F
60 GET A$: IF A$="" THEN 30
70 POKE 59466,0
```
This makes a "whooping" sound. The lines 60 and 70 provide a nice way to stop the program with silence—it gets annoying to stop a program and have the tone on. If you want a police car, change line 30:
```
30 FOR F = 200 TO 10 STEP -11
```
A more regular siren is done by sweeping back up—add these lines:
```
50 FOR F=10 TO 200 STEP 11
52 POKE 59464,F
53 NEXT F
```
Have fun "tuning" this one up—try 100,200 Step 3 and so forth.

"Space Sounds" can be made by changing the "whooping" program lines:
```
30 FOR F=1 TO 100
40 POKE 59464,255*RND(1)
```
Adding a delay makes random music:
```
45 FOR J= TO 100: NEXT
```
Changing the timbre can have interesting effects too. Try:
```
30 POKE 59464, 150
35 FOR F=0 TO 255
40 POKE 59466,F
```
And, remove line 45 and do it again! This one is more noisy—sort of like wind in a pipe to my ear.

Well, that should be enough to get you going on your favorite games. Making a good sound effect takes some time and care—remember to vary all three things: 1) frequency, 2) timbre, and 3) how far and how fast 1) & 2) change. Send me listings of your more nifty ones and I will publish the best of them.

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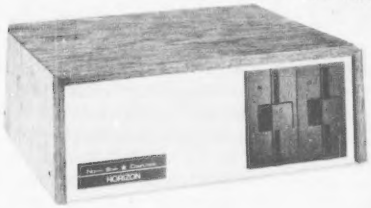

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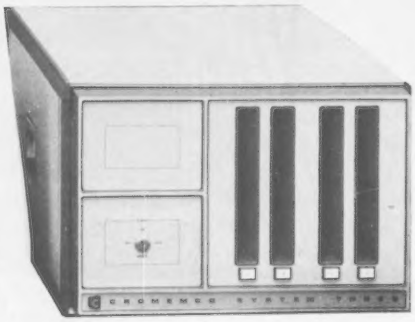

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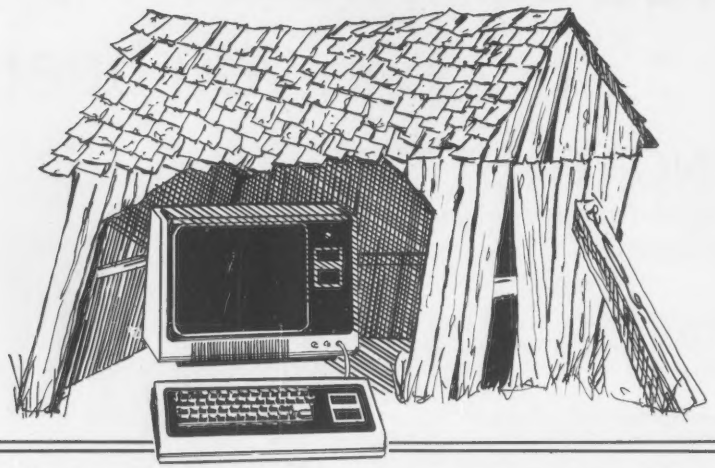


In this second column, we'll look at another TRS-80 magazine, SoftSide, and at two Radio Shack Programs, the Level-I BASIC Course and the In-Memory Information System.

We'll be getting into TRS-80 graphics pretty soon, within the next issue or two. There's a lot of good-looking computer art you can generate with rather short programs.

SoftSide. According to the editorial page of the first issue, "SoftSide was conceived and born within four weeks of frantic activity, and this first issue is fraught with all the rough edges that any fledgling publication is heir to. Please be patient, it's our beginning."

The first issue does have some rough edges, but mainly in the high ratio of advertising to programs. Otherwise, the first issue looks quite nice. The 56 pages are typeset, the layout is pleasing, and the new photographs of programs taken directly from a TRS-80 screen are the best I've seen yet.

The major article in this first issue, dated October 1978, is a 20-pager on a long cribbage program. Its outstanding feature, which I'd like to see more programmers use, is that the program is divided into sections, each section is given a name, and the purpose and process of each section is described in some detail, line by line when necessary. This is even better than REM lines, since it's much more detailed. All listings are TRS-80 printouts, a great help in eliminating typographic errors.

The other programs in the issue are a state capital quiz, Death Star game, calculator program, and a battleground game, Pillbox. Those take up 33 pages. Of the other 23 pages, 17 are ads, all for programs generated by The TRS-80 Software Exchange. Over 41 percent of the magazine is bread rather than meat, a rather high ratio unless you're very much in the market for TRS-80 programs. They offer, on Level-I and/or Level-II cassettes, programs by their staff and by outsiders. The range includes games from Checkers at $4.95 to Star Trek III at $14.95, business programs such as modular inventory management at $20, and personal software, including Biorhythms at $4.95.

Also offered are programs taped from listings in the Radio Shack manual, for those too busy or too lazy to key them in: the math subroutines are the ROM test, at $3 each. A nice touch is offering three of the programs printed in this first issue: Cribbage ($4.95), Pillbox ($3), and Calculator ($3).

The contents page notes, "For uniformity, we have adopted the Radio Shack TRS-80 Level-II BASIC as the BASIC dialect within the pages of this magazine. It was chosen because it stands to become the most commonly used dialect among microcomputer users, and because it shares a common heritage with the many microcomputer languages produced by Microsoft."

SoftSide is published monthly by SoftSide Publications, Box 68, Milford, NH 03055, at $15 for one year, $28 for two. The cover price is $1.50.

SoftSide is owned by managing editor Christopher E. Smith and by software editor Roger W. Robitaille, Sr. The latter owns The TRS-80 Software Exchange, although there's no indication in the pages of SoftSide that the two organizations are related, other than that they're both in Milford, New Hampshire.

Level-I BASIC Course. For $12.95 you get what at first looks like a one-inch-thick book with a black-and-silver cover. But inside, as the TRS-80 catalog says, is a four-cassette Level-I BASIC course that "contains eight lessons with 26 programs. Written by Dr. Ralph James and Dr. Ronald Lodewyck of University of California at Stanuslaus. Both are experienced educators and have combined their talents to produce one of the best computer-assisted instruction courses we have seen. It is a totally interactive, self-paced system designed to teach you how to use your TRS-80 to its fullest potential. If you are new to programming, this course is for you."

The Contents part of Lesson 1 takes a little less than a minute to run, and consists of a title page, the information that holding down the down-arrow key will cause the program to pause "to control the pace of your course," a table of contents, the exhortation "Let's launch right into the world of BASIC" with a clever Radio Shack rocket that blasts off skyward (be sure to list this part and figure out how the ingenious movement is programmed), and a note that to continue, you must CLOAD the next part. According to the User Instruction Manual, which gives the Table of Contents and also procedures for cassette loading, pause control, and student input, pauses are controlled by the *upward*-arrow key. Actually, either key will halt the RUN for as long as you hold it down.

The second part of Lesson 1, the Introduction, takes 80 seconds to load and, without pauses, 65 seconds to run. The actual run time, however, depends on how fast you read and how fast you INPUT your responses.

The first program is three lines long, calculates how many days old you are, and asks if you would like to see the program run again. If not, the next program is presented, converting Fahrenheit to Celsius, with your input. Then you have to load the next part.

The next part introduces line numbers by adding a line to the age program, to calculate how many months old you are. And before you

know it, it's time to load the next part. Of course, this is because only so much of a lesson can be stored in 4K of memory. And the boxes used frequently to surround text and examples, although giving a nicely formalized appearance to the lessons, do take up several lines per box.

After the line-numbers part, you're asked to proceed by loading Lesson 2. But if you turn the cassette over to Lesson 2 on the other side, you get a WHAT?, because you're only halfway through the first side. How come? Because, as on all Radio Shack program cassettes, each lesson is recorded twice, just in case of problems. So when you turn the cassette over, you're somewhere *in the middle of* Lesson 2, not at its beginning. So you either have to fast-forward Lesson 1 to its end, or rewind Lesson 2 to its beginning.

The lessons are very well written, with examples of how to use variables, for instance, and examples of how *not* to use them, plus novel features such as characters blinking to call attention to them, and using graphics blocks to underline or to point out a loop, for example. The user is asked to INPUT information for programs, and is also asked which of several given inputs has the wrong format. A correct answer results in compliments such as "RIGHT ON!" A wrong answer will cause the program to tell you what was wrong with that answer, and then the question is repeated.

Subsequent lessons teach INPUT, LIST, RUN, PRINT, TAB, PRINT AT, END, LET, IF/THEN, GOTO, READ, DATA, DIM, FOR/NEXT, ABS, INT, RND, SET, RESET, POINT, GOSUB, ON/GOTO, ON/GOSUB, and RESTORE.

The very last program gives a clever use of RESTORE to search through DATA statements for a matching INPUT number.

Although this course is very well written, memory limitations force the coverage to be quite brief, and the constant need to CLOAD (over two dozen times altogether) can be annoying. However, as during TV commercials, CLOAD time gives you ample opportunity to write checks for paying bills, file your nails (or throw them away), or have a snack.

I'd recommend the Level-I BASIC Instruction Course to a beginner wanting a very good quickie course, or for somebody who has trouble concentrating on the Level-I manual, and who needs a course that will force him to follow instructions and answer questions.

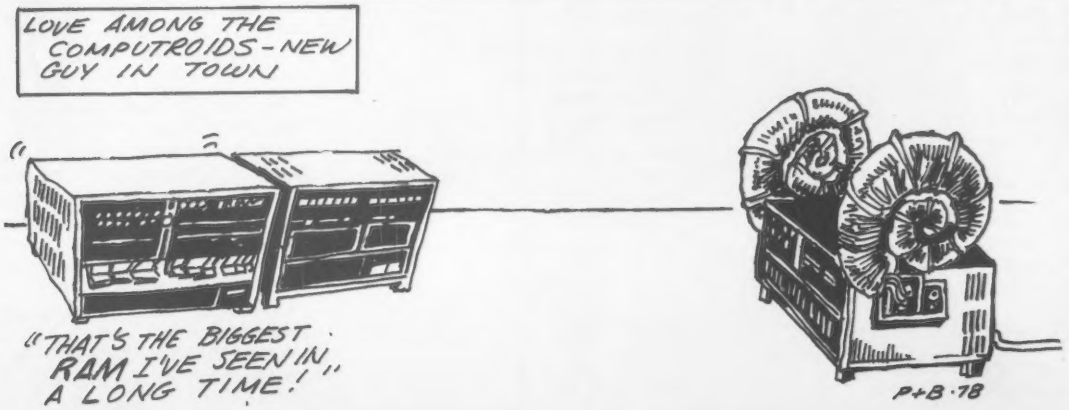
Incidentally, the little book-like cover is quite ingenious, storing four cassettes in a closed container. I was going to suggest that Radio Shack consider offering these (and perhaps also the three-ring binders that hold eight cassettes) in empty, unlabelled form, as they'd be just right for TRS-80 users (or for anybody else using cassettes, for that matter) to store their own personal tape libraries.

But on querying Radio Shack to find if any such plans were under way, I was told there's been an item in the Radio Shack catalog for some time, for storing music cassettes. It's a "folding cassette storage album," on page 57 of the 1979 catalog, storing 24 cassettes ($4.95 for item 44-609, which has a handle) or 12 cassettes ($2.59 for item 44-612). Looks to be very much like the same type of plastic cassette holders used in the TRS-80 program binders.

The Library 100 from **The Bottom Shelf** (Box 49104, Atlanta, GA 30359) consists of 100 TRS-80 programs. We received a preproduction copy of the first fifty for a 16K Level II machine. The tape includes two versions of Tiny PILOT - one in 4K, one in 16K. For the uninitiated, PILOT is a computer language designed for writing CAI dialogs, not a real heavyweight on structure like PASCAL, or a math workhouse like APL, or a universal language like BASIC, but it is nice for easing gently into programming and for educational applications. Judging from the documentation, this particular implementation looks like a good PILOT, but unfortunately the preproduction copy did not include documentation on how to write and execute PILOT programs, so we didn't actually try it.

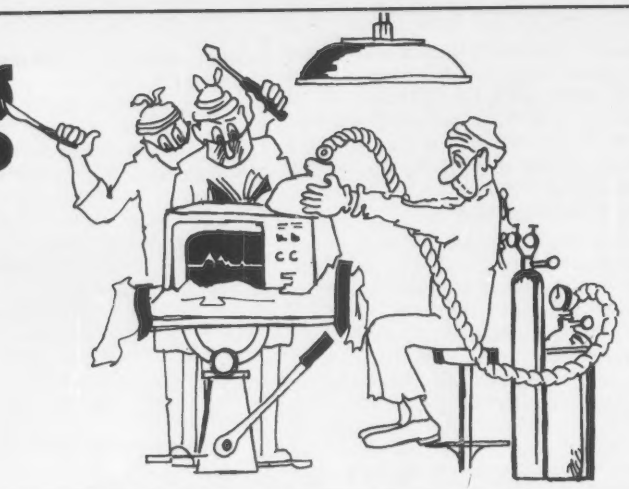
Following the PILOTs are BASIC programs. The first 25 are financial and investment applications, for problems such as calculating the present value of a future sum, number of days between dates, nominal and effective interest rates, future value of regular deposits, depreciation, and so on. These programs are menu-driven and self-prompting, so at each step you know exactly what you can type in, and error-checking features are included. Next there are ten CAI programs in history and geography, with such topics as capitals of the states, inventors and inventions, authors, presidents, etc. The student can select the category he wants, and then the type of question, such as true/false, multiple choice, and matching. Finally, there are some other miscellaneous games and math drills, including two Star-Wars-style games, two word jumblers, two memory testers, and even two very familiar-looking games, Rock-Scissors-Paper and Russian Roulette (could swear I saw them somewhere before, but it's probably my imagination).

100 programs for $49.50 is certainly a bargain, but none of the ones we tried are going to make you say, "Wow, I'm glad I bought a TRS-80 so I could run this program," though Tiny PILOT might have been an exception. Personally, I'd rather buy a few really fantastic programs than a truckload of average ones. On the other hand, if you need a wide assortment of financial calculations and other things this may be for you. ■



Operating Systems Q&A

John Craig



Did you know that Digital Research isn't necessarily the best place to buy a CP/M operating system ... even though they're the folks who developed it? The reason is because the versions of CP/M they offer are configured only for an Intel MDS system. (I guess you'd be in Fat City if you have an Intel MDS!) The OEMs (Original Equipment Manufacturers) who buy CP/M from Digital Research usually will configure a version for your particular system ... and certainly offer one configured for their system. Following is a partial list (those who authorized release of their names) of OEMs who support, and offer, CP/M:

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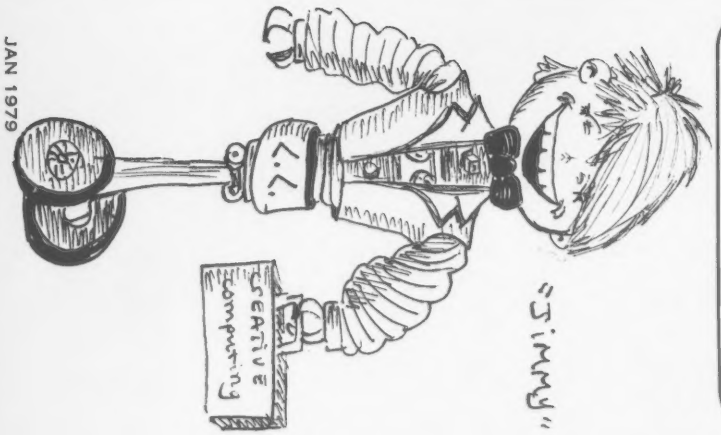
The CP/M User's Group is up to THIRTY-THREE VOLUMES! You might want to drop a line to them at: 164 W. 83rd St., New York, NY 10024. Ask for their list (North Star, Micropolis and standard diskettes) and enclose $4 (to get on their mailing list ... and get the initial list). Each diskette is $8 (diskette, copying & shipping).

United Software Applications, 342 Columbus Ave., Trenton, NJ 08629, has a modified version of CP/M, called OS/M, which you might want to check



into. (We're going to have a review of it in an upcoming issue of Creative.) It will run mini and standard disk drives at the same time. They have an impressive collection of utility and application programs ... such as: a North Star Basic Converter, a program for making your OS/M or CP/M system into an intelligent terminal, the game of Adventure(!), PILOT and more. They've developed a PILOT program which will be used for teaching people about the features and how to use OS/M. Along this same line, they're going to have dealer audio/visual aids for training customers about the system.

Miscellaneous: Radio Shack will be offering CP/M on the TRS-80 in the near future (as an option). Pertec will be offering CP/M on their systems, also. They've been plugging away with FDOS for several years, and it's a good system, but they appreciate the popularity of CP/M and feel they should jump on the wagon. You Digital Group owners might want to check General Technics, Inc. (in the above list) and see about the Digital Group format they're offering.

By the way, when you send in a question to Operating Systems Q&A it will be answered immediately. You won't have to wait until the next issue of the magazine comes out. Share your questions with others and drop a line to:

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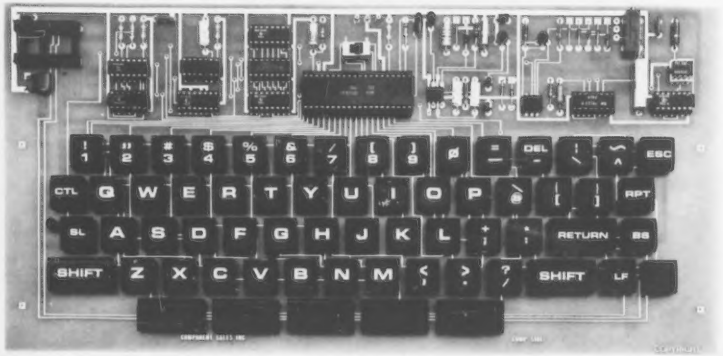

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CIRCLE 185 ON READER SERVICE CARD

Reviews

Stephen B. Gray

Computers, Computers, Computers, In Fiction and In Verse. D. Van Tassle, Editor. Thomas Nelson Inc., New York, or *Creative Computing* book service. 192 pp. Hardback. $6.95. 1977

These eleven short stories, well chosen by Dennie Van Tassel, represent a perspective on human beings living in a world whose lifestyle is dependent on computers. The writing, for the most part, is excellent, and the worlds created by the writers in which the computer is so much a reality are convincing backgrounds wherein the characters live and grow, providing the reader with ample ground for insight into the various ways computerization may influence people's very conceptions of themselves. There is a good variety in the outlooks the authors have on what computerization will mean to humanity, and I think these portrayals offer invaluable insight to the hundreds of thousands of people who are now working on shaping a computerized future.

My three favorite stories are Mack Reynolds "Criminal in Utopia", Michael Shaara's "2066: Election Day", and Barbara Paul's "Answer 'Affirmative' or 'Negative'". "Criminal in Utopia" develops the plight of Alex Moron, supposedly poor and desperate, a thief in a society controlled by the computer and a computerized credit card system that is given credit for having abolished the means and profit of thievery. "2066: Election Day" depicts the need to fool the computerized system of selecting a president the year no one is qualified. Although it is a committee that takes the tests, Shaara elucidates why Professor Larkin becomes President of the U.S. "Answer 'Affirmative' or 'Negative'" is a delightful story about a computer that answers questions in poetry, a 'precise' language. All of these stories are depictions of human attributes as affected by the computerized lifestyle so familiar to them, and are avenues of insight to the reader on the dimensions of our experimentations.

The book also offers pointed commentary to round out the portrayals of the fiction. Dennie Van Tassle's introduction is disappointing, knowing the range of his perspective on computer fiction and his quick pen, but this is more than compensated for by his excellent selection of stories and commentary that show how people might be in a life shared with and dependent on computer technology.

● ● ● ●

So You Want to Buy a Computer!, by Roger W. Brown. Scientific Research Inst., Box 490099, Key Biscayne, FL 33149. 155 pages, paperback $4.50.

Roger Brown tells it like it is, with a great deal of straight-from-the-shoulder talk that will make some hardware (and software) companies shudder. However, it all needed to be said, and this book is highly recommended to anybody thinking about buying a microcomputer for personal or business use.

Among his valuable pieces of advice are: don't get hung up on the chips (ask rather, will the computer do what I want it to do?), use a standard floppy rather than a mini-floppy disk for business applications, and "stay away from converted Selectric typewriters."

The products of 24 companies are discussed, from Apple to Vector Graphics in personal computers, and from Alpha to Wang in business computers. Some are praised, others have their "major shortcomings" described in detail. Peripherals are discussed, and software is thoroughly examined.

The last chapter, "Helpful suggestions before spending

money," is alone worth the price of the book. The addresses of dealers and manufacturers take up the last 23 pages.

Before you buy anything, especially if you're just getting into microcomputers, buy this book.

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How to Buy and Use Minicomputers & Microcomputers, by William Barden, Jr. Howard W. Sams & Co., Inc., 4300 West 62 St., Indianapolis, IN 46268. 240 pages, paperback $9.95. 1976.

The first five chapters provide an introduction to minicomputers, covering history, the basics, hardware, software and peripherals. An imaginary computer is used to introduce assembly-language programming, after which Motorola 6800 assembler and then BASIC are discussed, and for some curious reason a 3½-page tic-tac-toe program is given.

The chapter on how to select and buy a mini involves making up a comparison chart as an evaluation check list. The chapter on Programming Your System consists almost entirely of flowcharts.

Chapter 8, 64 pages long, is on Microcomputer Profiles. Actually, it is largely a review of four microprocessors—the 8080, 6800, F8 and 6502—with long charts of the instructions, plus 13 pages detailing ten hobby computers, several of which are no longer on the market: MITS Altair 8800, IMSAI 8080, Sphere 310, Micro-Sphere 200 (which never even got on the market), Southwest 6800, Wavemate Jupiter II, Systems Research SRI-500, Microcomputer Associates JOLT, EBKA 6502 Familiarizor and MOS Technology KIM-1.

The last chapter contains 44 pages of profiles: DEC PDP-8, Data General Nova, Computer Automation LSI-3/05, Interdata 6/16. An interesting appendix gives three sets of software benchmarks.

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Maze Craze 4. Charles Duncan, Troubador Press, 40 pages, paperbound, $1.95. 1978.

This latest sequel in the Maze Craze series features twenty-one boldly designed mazes reproduced from the original silkscreen prints of Charles Duncan. The mazes are printed in maroon on a heavy tan stock which provides a nice effect.

Personally, I like mazes that can be done by sight (without pencil) in a minute or two without becoming completely confused in your mind but which also provide a non-trivial challenge. This book meets those objectives nicely. A nice break from a frustrating computer program or the pressures of the job.

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Getting Acquainted With Microcomputers, by Louis E. Frenzel, Jr. Howard W. Sams & Co., Inc., 4300 West 62 St., Indianapolis, IN 46268. 288 pages, paperback $8.95. 1978.

Lou Frenzel has taken the time to write, very carefully, one of the best introductions to micros you can get, a welcome contrast to some of hurriedly assembled "quickies" around. Lou knows what he's talking about. Until recently, he was Director of Computer and Education Products at Heath, where he started the entire computer effort that resulted in the H-8 and H-11 computers and their peripherals, as well as all the Heath educational products. Now that the computer line is well established, Lou has become Director of Education and Publishing, to expand the educational business at Heath.

As the preface says, "this book was written for engineers, technicians, scientists and others who need to know about microcomputers." It's written so clearly and simply that any hobbyist over the age of 12 will find it a great help. After two chapters on the basics, you learn how to build or buy a microcomputer trainer. The chapters on software, programming and programming practice are alone worth the cost of the book. The last chapter on hobby and personal computing is a thorough and thoughtful look at the whole area and at several

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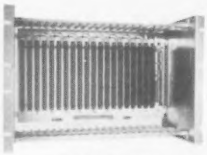

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specific machines, ending with tips on how to buy a system. Seven appendixes provide lists of microcomputer manufacturers, bibliography, magazines, courses, parts suppliers, 6800 instruction set and ASCII code.

If you want to learn all about the basics of micros, this is the book to buy.

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The BASIC Workbook: Creative Techniques for Beginning Programmers, by Kenneth E. Schoman, Jr. Hayden Book Co., Inc., Rochelle Park, NJ. 127 pages, paperback $5.50. 1977.

This hand-on book is an expanded series of lecture notes. Because only 20 keywords are introduced, it's not really a BASIC text, but as the preface notes, "With this limited vocabulary, however, one can do many things."

The book began as a graded collection of problems, and its main feature is the end-of-chapter problems, each at the top of a page, with the rest of the page blank, for working it out. If the student were to use his own paper to work out these 69 problems, the book could be about 44 pages shorter.

The first chapter, Computers and Problem Solving, starts out very slowly, with LET, PRINT and END in a three-line program, and ends with INPUT. Subsequent chapters are on Elementary Statements (IF-THEN, NEW, LIST, RUN), The Art of Programming (GOTO, REM, flowcharts), Loops (FOR-NEXT-STEP), Functions, Subscripted Variables (DIM), More About Input/Output (READ, DATA, RESTORE), Strings (LINPUT), Developing Larger Programs (GOSUB, RETURN, STOP), and Introduction to Simulation (craps, queuing). The best appendix is the third, More About Plotters.

The text is well-written and the problems good and varied, with helpful hints, but no answers given.

● ● ● ●

COBOL For Students, by Andrew Parkin. Edward Arnold (Publishers) Ltd., London; distributed by ISBS, Inc., Box 555, Forest Grove, OR 97116. 221 pages, paperback $8.95. 1975.

The book is in two parts. Part 1 concentrates on the fundamentals of the language and takes the student to a level where he can write a modestly sized COBOL program using serial files. Part 2, which is best used after the students have reinforced their knowledge of Part 1 through practical work, extends the student's knowledge of the language (direct-access file-handling, for example) and of techniques (such as two-dimensional arrays and program design).

Each part has ten sections that can accompany a course of ten lectures. The text consists of a few frames of fast-moving narrative followed by questions "designed to be a real test of the student's understanding of both concept and detail." Detailed answers are given at the end of each section.

The text is machine-independent and follows ANS COBOL.

The preface includes a checklist of the points of difference in the various dialects of COBOL, so that the reader may "make notes of the variations that apply to the particular computer" he is to use, such as the maximum length of a numeric literal.

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Robots on Your Doorstep, by Nels Winkless and Iben Browning. Robotics Press, 30 N.W. 23rd Place, Portland, OR 97210. 188 pages, paperback $6.95. 1978.

Subtitled "A Book about Thinking Machines," this is not a how-to text, but an examination of robots "in the past, present and future."

The first two chapters are heavy going, getting into the Anlage of creation, heterocatalysis, and biocoenose, just to put robotics into context, but necessitating a six-page glossary to explain these and 60 other buzzwords.

Four of the remaining chapters present "a tutorial narrative that gradually reveals the design of an artificial intelligence

system," but which is mostly about a simple pattern-recognition system that can differentiate between a triangle and a square, for example.

The remaining chapters offer various observations on intelligence in general, the structure and operation of the brain, and on certain characteristics of robots (mostly learning curves).

The last chapter, one page long, says that if the "average puzzled reader" seeks "an evaluation of this book from an authority, he will probably be told this is chiefly nonsense." Not really nonsense, but of interest only to hard-core robotniks.

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Instant BASIC, by Jerald R. Brown. Dilithium Press, 30 N.W. 23rd Place, Portland, OR 97210. 179 pages, paperback $9.95. 1977.

The main feature of this "active participation workbook," whose full title is "Instant Freeze-Dried Computer Programming in BASIC," is the "zaniest, wildest graphics available." Anything goes—Beardsley, op art, ancient woodcuts, pointing fingers and an amazing variety of display-type fonts. Adults may find it all a little too cutesy, but youngsters will surely find it a welcome relief from pages of solid text in other books.

The author assumes "you have ready access to your own personal computer or a system with BASIC PLUS," and teaches "Altair style BASIC and the similar DEC BASIC PLUS." The text is divided into READ and DO IT sections, the latter being programs to run. Each chapter ends with problems; answers are in the back of the book, mostly programs you're asked to write, from Slot Machine to Sales Report.

An informal writing style, a detailed examination of BASIC, a great many examples, and a highly imaginative use of graphics make this an ideal book for young people, and even for grownups who can catch the spirit.

The book was originally published by Dymax, whose books are now being published by Dilithium Press.

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Minimum COBOL, by CBEMA (Computer and Business Equipment Manufacturers Association). Petrocelli Books, Inc., 384 Fifth Ave., New York, NY 10018. 336 pages, paperback $10.00. 1977.

The second book in the PBI series "for the computer and data-processing professional," this provides detailed specifications of American National Standard Minimum COBOL, which is a subset of American National Standard Programming Language COBOL, X3.23-1974. The standard, described in this book "Was prompted by the need for a COBOL language which provides basic capabilities and yet can exist in environments such as minicomputer and time sharing, which impose resource limitations."

The press release elaborates, "The most widely used programming language, COBOL was originally intended to be easy to master and use. It has evolved to encompass some of the most complex, though useful, statements found in any programming language. As more complex statements proliferate, the need to simplify becomes even greater." Hence this standard.

The first section provides an introduction, a summary of elements by module, a list of elements showing their disposition among the various modules, definitions, a discussion of overall language considerations and a composite language skeleton. Sections II through XII contain specifications for the Nucleus and for each of the ten functional processing modules.

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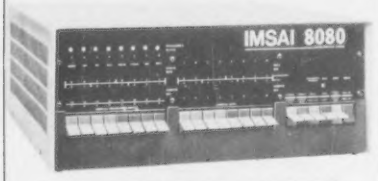

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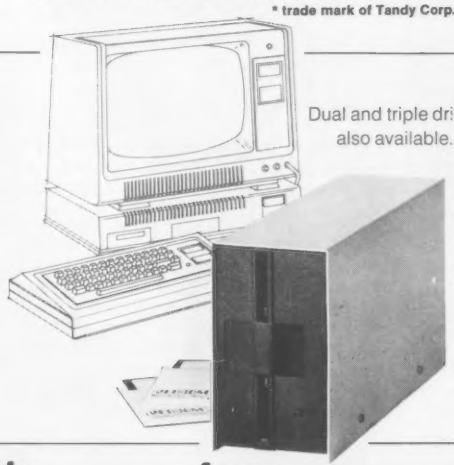

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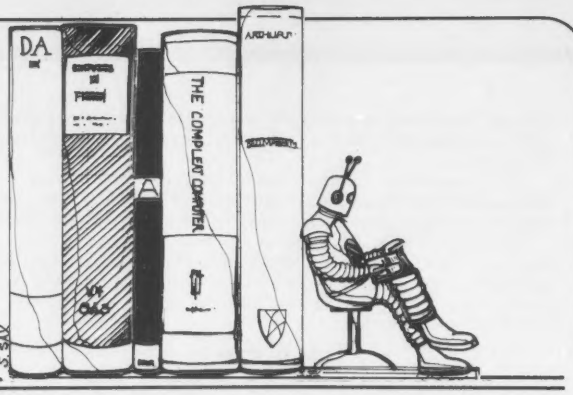
The Computer in Fiction

Dennie Van Tassel



Broke Down Engine by Ron Goulart. 1971. 192 pages. Collier Books, 866 Third Avenue, New York, New York 10022. $1.25.

Ron Goulart has collected together 13 of his stories about machines. Goulart's stories are funny and the machines never quite work right which should strike a familiar chord to computerniks. Goulart's stories are populated with walking refrigerators, robot servers and automated disposals fixed by automated repair robots. The trouble is that certain things are not quite right in "robotland." Well worth reading.

The Compleat Computer by Dennie Van Tassel. 1976. 216 pages. Science Research Associates, 1540 Page Mill Road, Palo Alto, California 94304. $5.95.

This is a collection of miscellaneous non-fiction and fiction about computers. The book is meant to be a fun book about computers. It contains about 10 stories and 15 poems about computers and an article on the computer in fiction. There is humor by Buchwald, Elliott and Goulding, and serious fiction by Clarke, Bradbury, Crichton and Asimov. The book also contains a great deal of cartoons and computer related art including a series of Doonsbury cartoons.

The Digital Villain by Robert M. Baer. 1972. 187 pages. Addison-Wesley Publishing Company, Reading, Mass. 01867. $5.50.

About half this nice book is devoted to discussing the role of robots and computers in fiction. The book uses excerpts from eight major pieces of this genre. Baer intersperses the excerpts with his own running commentary. Some of the pieces excerpted are *R.U.R., Billion Dollar Brain, Giles Goat Boy* and *2001*. Two of the pieces are robot stories and six are computer stories. This is a good introduction to the computer in fiction.

The Moon is a Harsh Mistress by Robert A. Heinlein. 1966. 301 pages. Berkley Publishing Corp., 200 Madison Avenue, New York, New York 10016. $1.50

This is one of my favorite computer fiction books. One reason I like it is because the computer is the hero. Quite often the computer is the villian. Instead, in this book we have a happy computer that tells jokes and helps his friends overthrow a tyranny. The computer is nicknamed Mike and if he likes you he will take care of you, but if he doesn't he will do tricks like jam your heating control so it is stuck at 105 degrees on a hot day.

Of Mice and Machines by Arthur O. Lewis, Jr. E. P. Dutton & Co., Inc., 201 Park Ave. S., New York, New York 10003. $3.95.

This book is not centered on just computers, it surveys human beings' relationship with all machines. The book looks into the past and the future, and views machines as both friends and enemies. Capek's *R.U.R.* and E.M. Forester's "The Machine Shop" are included in this book. Both are excellent stories. The value of this book is that it pulls things together for a very wide selection of sources and opinions.

Science Fiction Thinking Machines by Groff Conklin. 1954. 367 pages. Vanguard Press, Inc., 424 Madison Avenue, New York, New York 10017. $7.95.

This anthology contains 22 stories—14 about robots, 4 about androids and 4 about computers. The first computer story, "Answer" by Hal Clement, is interesting because of its wrong guesses. The author predicted that future computers could only become more powerful by growing larger and larger. Thus the world's largest computer is stuck on the moon so it will have room and its millions of vacuum tubes can be easily cooled. "Sam Hall" by Poul Anderson is one of my favorites. It is about the downfall of the National Data Bank. A programmer enters a phoney person "Sam Hall" into the computer data bank and uses him to create a fictional outlaw. The outlaw can't be found even by the national data bank since he doesn't exist. The robot stories are good.

A.R.T.H.U.R.: The Life and Opinions of a Digital Computer. 1975. 66 pages. The University of Massachusetts Press, Amherst, Mass. 01002. $3.95.

This book is a collection of poetry about computers. The poetry is written from the point of view of a computer. It is difficult to describe but I liked it and thought it quite good.

Berserker by Fred Saberhagen. 1967. 190 pages. New York: Ballentine Books, Inc. Out of Print.

This a special genre of computer related fiction. This book contains 11 stories on berserkers. Berserkers are the ultimate in war machines. They are giant computer run space ships that were built by some unknown civilization. A berserker's sole purpose is to destroy all forms of life. These berserkers have now drifted into earth people's system and earth people fight them for survival. The stories in this book are fairly interesting.

The Fall of Collossus by D.F. Jones. 1975. Berkley Publishing Co., 200 Madison Ave., New York, New York 10016. $ .95.

These are two books. I believe the first book is out of print. The first book was made into a movie called *The Forbin Project*, which is a classical science fiction movie. The books involve a large defense computer which is supposed to defend the U.S., but instead it takes over the world. Both books are good. The interesting things about the books is that it points out an often overlooked fact regarding artificial intelligence: any machine intelligence will be foreign to human intelligence.

The Desk Set by William Marchant. 90 pages. 1955. Samuel French, Inc. 7623 Sunset Blvd., Hollywood, Calif. 90046. $2.69.

I am only familiar with two plays on computers: Capek's *R.U.R.* and this play. Both plays are fairly good. This play involves a reference department in a large radio-and-television broadcasting company. An efficiency expert feels the whole department could be easily replaced by a computer. The girls of the reference department continually outsmart the efficiency expert and are obviously necessary, but the computer wins in the end. Nice play, except for the ending.

Glorobots by Gloria Maxson. 62 pages. 1977. Order from: Gloria Maxson, 13602 Cullen, Whittier, Calif. 90605. $3.00.

Some of you may be familiar with these short poems. Gloria Maxson has had her poems published in many computer magazines. She has now collected these poems into a small book. Instead of a review I will give you an example:

In an effort at human emotion,
an old robot drank a love potion,
  and started to pet
  with an old TV set
in a rush of abnormal devotion.

Introducing the personal computer you've waited for. The Exidy Sorcerer.

I didn't buy my personal computer until I found the one that had all the features I was looking for.

The Exidy Sorcerer does everything I wanted to do and a few things I never dreamed of.

It isn't magic. Exidy started with the best features of other computers, added some tricks of their own, and put it all together with more flexibility than ever before available. Presto! My reasons for waiting just disappeared.

I wanted pre-packaged programs. Software on inexpensive cassette tapes for the Sorcerer is available from Exidy and many other software makers.

I wanted user programmability. The Sorcerer's unique plug-in ROM PAC™ Cartridges contain programming languages such as Standard (Altair 8k*) BASIC, Assembler and Editor (so I can develop system software), operating systems such as DOS (so I can also use FORTRAN and COBOL) and applications packages such as Word Processor.

* Altair is a trademark of Pertec Computer Corp.

I wanted graphics, and the Sorcerer is super. Its 256 character set—more than any other personal computer—includes 128 graphic symbols that I can define.

I wanted high resolution video. With 122,880 points in a 512 x 240 format, I get the most detailed illustrations.

I wanted to display more information. The Sorcerer displays 1920 characters in 30 lines of 64 characters —equal to a double-spaced typed page.

I wanted a full, professional keyboard. The Sorcerer's 79-key data processing keyboard provides designated graphics, the complete ASCII character set in upper and lower case, and a 16-key numeric pad.

I wanted memory. The 12k of ROM holds a Power-On Monitor and Standard BASIC; the 8k of RAM is internally expandable to 32k.

I wanted expandability. Serial and parallel I/Os are built in, and the optional 6-slot S-100 expansion unit lets my system grow.

I wanted a computer that's easy enough for children to use. I just connect my Sorcerer to a video display and a cassette tape recorder, and if I have any questions the easy-to-understand Operation and BASIC Porgramming manuals have the answers.

I wanted to buy from an experienced manufacturer. In five years Exidy has become the third largest producer of microprocessor-based video arcade games.

I wanted to spend less than a thousand bucks. (This is where Exidy does a little magic.) My Sorcerer cost me $895!

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CIRCLE 198 ON READER SERVICE CARD

Guidance Counselor System ... college placement program

Lou Kirschner

The battle is being waged by the public asking what schools are doing for our children, what is the role of guidance couselors and why is there a need for various new programs when the public doesn't see them or hear about them?

With the ever-advancing negative relationship between board of education members, teachers and the general public, added to the insecurity of the job market, millions of parents are wondering what the schools are doing for their tax dollar. An informed public can be a dangerous tool in the hands of politicians.

When you go to the supermarket to buy five pounds of tomatos, or pay for a new roof on your house, you visibly see what you are getting for your hard earned money. The general public does not see their child learning to read or does not see their child typing sixty words per minute, nor do they know that the job counselor has spent many hours talking to businessmen in an attempt to have them hire high school students for a part time job.

As a guidance office we do the same communicating that other schools do. We send out fliers inviting parents to meet the counselors for scheduling subjects, make phone calls, send letters and write in the school newsletter articles pertaining to the guidance program. Even with a concerted effort, too few parents are seen. The most basic and major deterrent in seeing the parents is, of course, that the parents work during the day, as do the teachers. Jim Bogan, our career counselor, and myself set out to inform the parents on the use of the computer in the education field and the great benefits that are offered for them and their children. Obviously, if Allah could not go to the mountain, the mountain must come to Allah.

Lou Kirschner, 1122 Leonard Road, Pt. Pleasant, NJ 08742

We decided to run a computer program on college and occupational education on Wednesday evenings. I talked to high school seniors and asked each individual senior if they would like to visit on a Wednesday evening with their parents and use the computer to seek and select a college. The response was amazing in that both the father and mother nearly always showed up. It was good to see the father involved in this planning process. Too many times we never see the father involved because of job commitments.

The first step was that one counselor sat down with the family to explain how the computer is used and with the combination of the youngsters past records, S.A.T.'s, class rank, personal guidance and the computer all combined, we felt that all this would lead to a better and more accurate selection.

After all the above counseling is completed, we all sat down at the computer and one counselor read out the choices selected while the other counselor actually ran the computer.

Fig. 1 is an actual case handled with a male student and both parents present. The numbers to the left of the sheet are the code numbers. To the right are the number of colleges that are left. The more select one is in choosing his or her college, the fewer the number of colleges one can select from.

Fig. 1

349 Courses of Study Psychology	1140 colleges remain
432 Area Mid Atlantic	226 colleges remain
504 Population of 10,000 over student body	34 colleges remain
508 Co-ed	26 colleges remain
515 Public Control	19 colleges remain
556 Competitive Level	8 colleges remain
590 Tuition, Room and Board	5 colleges remain
689 Med Verbal S.A.T.s	5 colleges remain
695 Med Mat S.A.T.s	5 colleges remain
725 Athletic Programs—Football	4 colleges remain

Colleges: Rutgers University
State College N.Y. in Albany
State College N.Y. in Stony Brook
Penn State University

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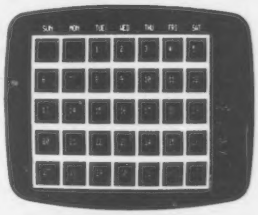

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The entire time spent between parents, youngsters, and running the computer was a total of thirty minutes.

Psychology was the course of study chosen and there were 1140 colleges that offered degrees in psychology from the overall number and other selections we were able to bring the number down to 4. There are many other selections a youngster may choose from if he or she feels they are important in choosing a college. If the selection is not important then we do not feed that number into the computer (e.g., a youngster does not care if the school is public or private control). Below are all the various choices.

1. Four year college
2. Course of Study
3. Location
4. Size of Town or City near by
5. Total enrollment
6. Male, Female ratio
7. Public or Private Control
8. Religious affiliations, if wanted
9. Admission requirements
10. Competitive level
11. Application deadline
12. Cost—In State or out of State
13. Financial aid
14. Type of Institution—University, College, Tech.
15. Accreditation
16. Special Programs
17. Campus Life
18. S.A.T. requirements
19. Athletic Program
20. Clubs
21. Emerging new fields

Needless to say the parents and students were impressed and were saved several months frustration in looking through catalogs, pamphlets, and other paraphernalia which did not pertain to their needs.

The most important product, of course, is that we served and helped the youngster in choosing a college. There are many strong by-products such as seeing the parents and public presented with a positive image of the guidance counselor and school and spreading good public relations throughout the township. Also we are now teaching our youngsters how to run the computer which is a new experience within itself.

I personally feel that teachers, counselors and administrators can spread the gospel of education if they not only reach their students, but also involve the parents and the general public. ■

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GT-6 DRIVER'S ED — This can either serve as an instructional aid for high school age youngsters learning to drive or as a fun, educational game for younger children. Features include. extensive use of graphics, informing user of correct answer when he or she misses a question, and randomization of question order to insure that the testee can not answer using a pattern. Actually shows a picture of each subject it asks a question about.

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Help For The Weary Taxpayer

Gary Young

A better way to calculate depreciation. Look out IRS!

Have you ever wondered about the impact on your taxes if you purchased some depreciable asset such as property or more equipment? Should you depreciate it over three, five, or seven years? Straight line or declining balance depreciation? Investment tax credit? Should you wait a month or two to buy it? How much tax will it actually save? This program will help you make these decisions.

Program Input

The program first requests the depreciable amount (purchase price less salvage value). Next it will request the month and year of the purchase (for example, 7,78 for July or 0,78 if you had it all year). This data is used to figure the actual depreciation during a calendar year when the date the asset was purchased does not occur exactly at a calendar year end. Finally the program will request the normal taxable gross income without this depreciation deduction. This figure is used to calculate the actual tax dollars saved. One thousand dollars in depreciation in the $30,000 tax bracket will save more tax than the same amount in the $10,000 tax bracket.

The federal and California state income tax tables in the program are defined for single taxpayers and will have to be changed for married taxpayers or different states. The tables are defined in DATA statements and

Gary Young, Surf Computer Services,
PO Box 66572, Los Angeles, CA 90066.

```
RUN

TAX DEPRECIATION PROGRAM VERSION 3
DEPRECIABLE AMOUNT? 2270
PURCHASE DATE (M,Y)? 5,78
NORMAL TAXABLE GROSS? 20000


DECLINING BALANCE METHOD FOR 3 YEARS
YEAR              1978   1979   1980   1981
FULL YR DEPR      1135    756    378
ACTUAL YR DEPR     662    914    535    157
TAX $ SAVED        297    411    241     70

TAX CREDIT          75    TOTAL $ SAVED          1096
FIRST YEAR $       372    WAITING COST/MONTH       43


STRAIGHT LINE METHOD FOR 3 YEARS
YEAR              1978   1979   1980   1981
FULL YR DEPR       756    756    756
ACTUAL YR DEPR     441    756    756    315
TAX $ SAVED        198    340    340    141

TAX CREDIT          75    TOTAL $ SAVED          1096
FIRST YEAR $       273    WAITING COST/MONTH       28


DECLINING BALANCE METHOD FOR 5 YEARS
YEAR              1978   1979   1980   1981   1982   1983
FULL YR DEPR       756    605    454    302    151
ACTUAL YR DEPR     441    668    517    365    214     63
TAX $ SAVED        198    300    232    164     96     28

TAX CREDIT         151    TOTAL $ SAVED          1172
FIRST YEAR $       349    WAITING COST/MONTH       28


STRAIGHT LINE METHOD FOR 5 YEARS
YEAR              1978   1979   1980   1981   1982   1983
FULL YR DEPR       454    454    454    454    454
ACTUAL YR DEPR     264    454    454    454    454    189
TAX $ SAVED        119    204    204    204    204     85

TAX CREDIT         151    TOTAL $ SAVED          1172
FIRST YEAR $       270    WAITING COST/MONTH       17
```

```
DECLINING BALANCE METHOD FOR 7 YEARS
YEAR              1978   1979   1980   1981   1982   1983   1984   1985
FULL YR DEPR       567    486    405    324    243    162     81
ACTUAL YR DEPR     331    520    439    358    276    195    114     33
TAX $ SAVED        148    234    197    161    124     88     51     15

TAX CREDIT         227    TOTAL $ SAVED          1248
FIRST YEAR $       375    WAITING COST/MONTH       21


STRAIGHT LINE METHOD FOR 7 YEARS
YEAR              1978   1979   1980   1981   1982   1983   1984   1985
FULL YR DEPR       324    324    324    324    324    324    324
ACTUAL YR DEPR     189    324    324    324    324    324    324    135
TAX $ SAVED         85    145    145    145    145    145    145     60

TAX CREDIT         227    TOTAL $ SAVED          1248
FIRST YEAR $       312    WAITING COST/MONTH       12
```

```
1000 PRINT "TAX DEPRECIATION PROGRAM VERSION 3"
1100 REM WRITTEN BY GARY YOUNG
1200 REM              PO BOX 66572
1300 REM              LOS ANGELES, CA 90066
1400 DIM T1(4,10),T2(4,5)
1500 REM FEDERAL SINGLE TAXPAYERS
1600 REM FORMAT OF DATA STATEMENTS IS
1700 REM LOW LIMIT, HIGH LIMIT, TAX, PERCENT OVER LOW LIMIT
1800 DATA 10200,12200,1590,25
1900 DATA 12200,14200,2090,27
2000 DATA 14200,16200,2630,29
2100 DATA 16200,18200,3210,31
2200 DATA 18200,20200,3830,34
2300 DATA 20200,22200,4510,36
2400 DATA 22200,24200,5230,38
2500 DATA 24200,28200,5990,40
2600 DATA 28200,34200,7590,45
2700 DATA 34200,40200,10290,50
2800 REM FICA = .081 UP TO 16500 FOR 1336.50
2900 REM CALIF STATE SINGLE TAXPAYERS
3000 DATA 9500,11000,320,7
3100 DATA 11000,12500,425,8
3200 DATA 12500,14000,545,9
3300 DATA 14000,15500,680,10
3400 DATA 15500,1000000,830,11
3500 FOR J=1 TO 10
3600 READ T1(1,J),T1(2,J),T1(3,J),T1(4,J)
3700 NEXT J
3800 FOR J=1 TO 5
3900 READ T2(1,J),T2(2,J),T2(3,J),T2(4,J)
4000 NEXT J
4100 DIM D1(8),D2(8),D3(8),D5(3),D6(3),D7(3)
4200 REM YEARS DEPRECIATED
4300 D5(1)=3\D5(2)=5\D5(3)=7
4400 REM SUM OF THE DIGITS FOR DECLINING  DEPRECIATION
4500 D6(1)=6\D6(2)=15\D6(3)=28
4600 REM % OF AMT FOR TAX CREDIT
4700 D7(1)=.333333\D7(2)=.666666\D7(3)=1.00
4800 INPUT "DEPRECIABLE AMOUNT? ",P1
4900 INPUT "PURCHASE DATE (M,Y)? ",M1,Y1
5000 M2=12-M1
5100 INPUT "NORMAL TAXABLE GROSS? ",G9
5200 PRINT\PRINT\PRINT
5300 REM COMPUTE NORMAL TAX AMT
5400 G1=G9\GOSUB 14100\Z9=T4
5500 FOR J1=1 TO 3
5600 FOR J2=1 TO 8\ D1(J2)=0\D2(J2)=0\NEXT J2
5700 REM COMPUTE THE TAX CREDIT - L9
5800 L9=INT(P1*D7(J1)*.10)
5900 PRINT "DECLINING BALANCE METHOD FOR",D5(J1)," YEARS"
6000 Y2=Y1
6100 PRINT "YEAR",TAB(15),
6200 FOR J2=1 TO D5(J1)+1
6300 PRINT %7I,INT(1900+Y2),
6400 Y2=Y2+1
6500 NEXT J2
6600 PRINT
6700 Y2=D5(J1)
6800 PRINT "FULL YR DEPR",TAB(15),
6900 REM COMPUTE THE FULL YEAR DEPRECIATION
7000 FOR J2=1 TO D5(J1)
7100 D1(J2)=Y2/D6(J1)*P1
7200 REM %7I MEANS PRINT THE NUMBER AS AN INTERGER 7 DIGITS LONG
7300 PRINT %7I,INT(D1(J2)),
7400 Y2=Y2-1
7500 NEXT J2
7600 PRINT
```

formatted as low limit, high limit, tax and percent over the low limit. For example, consider the program statement "DATA 18200,20200,3830,34". The tax on $20,000 would be $3830 + ($20,000 - $18,200) × .34 or $4442. F.I.C.A. is calculated at 8.1% of the first $16,500.

Program Output

The program output consists of declining balance and straight line depreciation calculations for three, five and seven years. The computations are shown for an extra year in case the asset life does not coincide with a calendar year. Full year depreciation would be the depreciation for a whole year of the life of the asset, while actual year depreciation is the depreciation that can be declared on your taxes because of the date purchased. Tax dollars saved is the difference between the taxes paid without the depreciation deduction and the taxes paid with the deduction. The tax credit is the investment tax credit that can be claimed when purchasing an asset. The total dollars saved is the sum of the tax credit and the tax dollars saved each year during the depreciation period. The first year dollars is the sum of the tax credit and the taxes saved during the first year. The waiting cost per month is the additional tax that will have to be paid if you wait another month before making the purchase. This value is derived from the tax dollars saved during the first year (without the tax credit) divided by the number of months that it covers.

Summary

The program was written in North Star Basic (release 3) and uses about 4K of memory. No disk or sophisticated features are used so the program should be easy to convert to other systems.

The sample run projects the effect of purchasing a new terminal for $2270 in May, 1978. If the objective is to gain the biggest tax savings as soon as possible, then the terminal should be depreciated on a declining balance over three years. If the objective, however, is to recover the most overall tax savings, then a seven year plan would be better. Knowing the exact tax savings makes it easier to justify the purchase. ■

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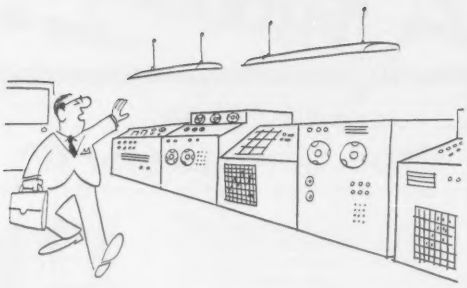
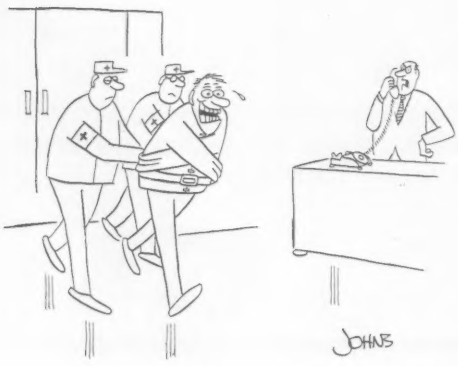
```
7700 PRINT "ACTUAL YR DEPR",TAB(15),
7800 REM COMPUTE THE DEPRECIATION CROSSING FULL YEARS
7900 Y2=M2/12
8000 FOR J2=1 TO D5(J1)+1
8100 D2(J2)=D1(J2-1)*(1-Y2)+D1(J2)*Y2
8200 PRINT %7I,INT(D2(J2)),
8300 NEXT J2
8400 PRINT
8500 PRINT "TAX $ SAVED",TAB(15),
8600 Z3=L9
8700 REM COMPUTE THE TAX WITH THE DEPRECIATION DEDUCTION
8800 FOR J2=1 TO D5(J1)+1
8900 G1=G9-D2(J2)
9000 GOSUB 14100
9100 REM COMPUTE THE DIFFERENCE IN TAXES
9200 T5=Z9-T4
9300 REM SAVE THE FIRST YEAR TAX SAVINGS FOR THE SUMMARY
9400 IF J2=1 THEN Z4=T5
9500 PRINT %7I,INT(T5),
9600 Z3=Z3+T5
9700 NEXT J2
9800 PRINT
9900 REM PRINT SUMMARY
10000 GOSUB 16700
10100 PRINT "STRAIGHT LINE METHOD FOR",D5(J1)," YEARS"
10200 FOR J2=1 TO 8\D1(J2)=0\D2(J2)=0\NEXT J2
10300 REM LOGIC FOR STRAIGHT LINE METHOD IS SIMMILAR EXCEPT FOR
10400 REM FULL YEAR COMPUTATION
10500 Y2=Y1
10600 PRINT "YEAR",TAB(15),
10700 FOR J2=1 TO D5(J1)+1
10800 PRINT %7I,INT(1900+Y2),
10900 Y2=Y2+1
11000 NEXT J2
11100 PRINT
11200 PRINT "FULL YR DEPR",TAB(15),
11300 FOR J2=1 TO D5(J1)
11400 D1(J2)=P1/D5(J1)
11500 PRINT %7I,INT(D1(J2)),
11600 NEXT J2
11700 PRINT
11800 Y2=12-M1
11900 Y2=Y2/12
12000 PRINT "ACTUAL YR DEPR",TAB(15),
12100 FOR J2=1 TO D5(J1)+1
12200 D2(J2)=D1(J2-1)*(1-Y2)+D1(J2)*Y2
12300 PRINT %7I,INT(D2(J2)),
12400 NEXT J2
12500 PRINT
```



"GOOD MORNING, FRANK... HI, STEVE... HOWS IT GOING, JIM? YOURE LOOKING GOOD, ED..."



"LISTEN... YOU'LL SIMPLY HAVE TO SEND A MAN BACK HERE TO GIVE US MORE INSTRUCTIONS ON HOW TO OPERATE YOUR NEW 684 MODEL!"

```
12600 Z3=L9
12700 PRINT "TAX $ SAVED",TAB(15),
12800 FOR J2=1 TO D5(J1)+1
12900 G1=G9-D2(J2)
13000 GOSUB 14100
13100 T5=Z9-T4
13200 IF J2=1 THEN Z4=T5
13300 PRINT %7I,INT(T5),
13400 Z3=Z3+T5
13500 NEXT J2
13600 PRINT
13700 GOSUB 16700
13800 NEXT J1
13900 PRINT\PRINT\PRINT
14000 END
14100 REM ACTUAL CALCULATION SUBROUTINE
14200 REM FEDERAL TAX CALCULATION
14300 FOR J=1 TO 10
14400 IF G1>T1(2,J) THEN 14800
14500 IF G1<T1(1,J) THEN PRINT "ERROR 1 ",T1(1,J),G1,T1(2,J)
14600 T1=T1(3,J)+(G1-T1(1,J))*T1(4,J)*.01
14700 EXIT 15100
14800 NEXT J
14900 PRINT "AMOUNT NOT IN FED TAX TABLE ",G1
15000 REM STATE TAX CALCULATION
15100 FOR J=1 TO 5
15200 IF G1>T2(2,J) THEN 15600
15300 IF G1<T2(1,J) THEN PRINT "ERROR 2 ",T2(1,J),G1,T2(2,J)
15400 T2=T2(3,J)+(G1-T2(1,J))*T2(4,J)*.01
15500 EXIT 15900
15600 NEXT J
15700 PRINT "AMOUNT NOT IN CALIF TAX TABLE ",G1
15800 REM FICA CALCULATION
15900 IF G1<16500 THEN 16300
16000 T3=1336.50
16100  GOTO 16400
16200 REM 8.1% ASSUMES SELF EMPLOYED PERSON
16300 T3=G1*.081
16400 T4=T1+T2+T3
16500 RETURN
16600 REM SUMMARY ROUTINE
16700 PRINT
16800 PRINT "TAX CREDIT",TAB(15),%7I,INT(L9),
16900 PRINT TAB(26),"TOTAL $ SAVED",TAB(45),%7I,INT(Z3)
17000 PRINT "FIRST YEAR $",TAB(15),%7I,INT(Z4+L9),
17100 PRINT TAB(26),"WAITING COST/MONTH",TAB(45),%7I,INT(Z4/M2+.50)
17200 PRINT\PRINT\PRINT
17300 RETURN
17400 REM THIS IS THE LAST STATEMENT
READY
```

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CIRCLE 134 ON READER SERVICE CARD

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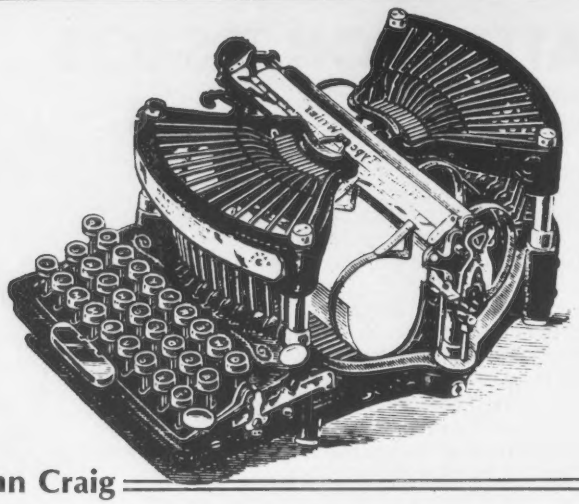
CIRCLE 122 ON READER SERVICE CARD

Editorial

Directions . . . As We Enter Our Fifth Year



John Craig

When is the last time you considered which publication (out of the many in this field) is going to wind up being *the* consumer magazine of the future? Which one of the magazines on the market today is going to appeal to those tens (and eventually hundreds) of thousands of consumers who go out and buy home computers in the years to come? Is it going to be one of those with a name that has meaning only for computer professionals . . . or will it be one with a name like *Creative Computing*? (Has a nice ring to it, don't you think?)

What do you think would be needed in the way of editorial content for such a magazine? Since the most important thing we'll be doing is putting computers to practical use, I would think an emphasis on applications would be in order. General interest and tutorial articles dealing with applications would be in demand. More importantly, articles actually describing an application, and providing the software (which everyone can use) will be appreciated even more. Should these articles deal primarily with programs written in Basic, or Fortran, APL, Focal, Pascal, or assembly-language? At the moment, I personally get more excited about a good applications program written in Basic, that the majority of people can use, than the idea of going back to square one and using a new language which is not in widespread use. Furthermore, assembly-language programs/articles will be somewhat limited in appeal because of the machine dependence and the level of expertise required to do that kind of programming. That is not to say that most people aren't able to learn machine-language programming . . . I don't think most of them will want to (if they have a good Basic to run instead). In the future as Pascal and other languages become widely available you'll want applications for them too.

What about all the computer hobbyists? Is there going to be material in this "consumer-oriented" magazine for them? That's an interesting question . . . just as that non-technical consumer is going to turn out to be an interesting person. You just watch those people go out and buy personal computers in the years to come! Most of them will make their purchase, bring it home, plug it in, put a cassette (or disk) in . . . and run a program. How long do you think it will be before they start going in and modifying programs, writing their own programs and/or making little hardware modifications to their machines? You realize, of course, what they'll be called as soon as they start doing such things? That's right, hobbyists. And, I guess we're all hobbyists to one degree or another. One of my favorite quotes is an excerpt from an article on computers in the September, 1966 (13 years ago!) issue of *Scientific American*:

". . . as with television, and then color television, the enthusiasts and the well-to-do will be the first to install computer consoles in their homes. Eventually, however, everyone will consider them to be essential household equipment. People will soon become discontented with the "canned" programs available; they will want to write their own. The ability to write a computer program will become as widespread as the ability to drive a car."

There are two areas which will always be linked to home uses of personal computers. One of these is educational applications and computers in schools. Students are going to be getting exposure to small systems in schools . . . and thereby influence the purchase of a computer in their home. Or, it could work the other way around! The other area is small business applications. A person using a system at home would have to be fairly dense not to see the potential for using a similar system in his business or office. Needless to say, many people using them at work will also see the potential for home applications.

Now . . . for the real reason I've brought you all here today. It wasn't to toot our horn (and, of course, I *have* been talking about *Creative*) or tell you how great we are or how great we're going to be. No, I've got a much better objective in mind. I wanted to tell you, the readers of *Creative*, where we're going in the future . . . and then I'd like you to pass the word! With our variety of articles on applications, general interest, fiction, cartoons and good, objective reviews of hardware and software we have the necessary ingredients to be the best in the field. Tell people about it, okay? As hard as it may be for you to believe there are people out there who aren't subscribing! ■

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CIRCLE 189 ON READER SERVICE CARD

Survey of Educator's Attitudes Toward Computers

David Lichtman, Ed.D.

It is axiomatic that educators (teachers and administrators) make the majority of decisions affecting the nature, style, and often the content, of instruction. Since many people believe that computers will improve education (Ahl, 1976) it seems worthwhile to determine if corresponding attitudes exist on the part of professional educators. A survey of 189 pre-service and in-service educators enrolled in summer programs at the University of South Carolina was completed in 1976. The general format of David Ahl's "Survey of Public Attitudes Toward Computers in Society" was followed to allow for comparisons between the two groups.

In general, the educators seemed less enthusiastic about the computer's role than did the general public. Those in administration courses were, generally, far more positive than were other educators. While the "teachers" (educators minus those in administration courses) appeared to be one of the highest groups in agreement with the statement "credit rating data banks are a worthwhile use of computers," they showed the lowest percentage in feeling that computers will improve health care, law enforcement or education. Those in administration, on the other hand, were more in agreement than the general public that "computers will improve education."

Methodology

In 1975 *Creative Computing* magazine conducted a survey of the general public's attitudes toward computers and their role in society. The survey, administered to 843 people, consisted of 17 questions divided into four major categories:

1) Computer Impact on the Quality of Life
2) Computer Threat to Society
3) Understanding the Role of Computers
4) Understanding the Computer Itself

In each case the respondents were asked to strongly agree, agree, neither agree nor disagree, disagree or strongly disagree with each statement. The results were then divided into percentage replies for each category, with the published tabular results compiled into percentages of those who strongly agreed and agreed, and those who strongly disagreed and disagreed with each statement.

The same format was followed in the current survey, with the addition of six further statements. The survey forms, with the statements in random order, were distributed in classes conducted by a variety of faculty members during the 1976 summer session in the College of Education at the University of South Carolina. Reactions were recorded on computer amenable answer sheets which were processed by the University's IBM/370 using SAS-76. All replies were anonymous.

There were 189 respondents, with 27 enrolled in administration courses. These were divided into two groups, loosely referred to as "teachers" (those not in administration courses) and "administrators" (those in administration course). These groups included pre-service as well as in-service personnel. *Creative Computing*'s original survey was broken down into two groups: adults (those 21 and older) and youth (those 20 and younger). The original results are presented here along with the current data.

Summary

In general, the educators seemed less enthusiastic about the computer's role in society than did the general public. Those in administration courses were, generally, far more positive in their attitudes than were other educators. As an example, while teachers appeared to be one of the highest groups in agreement (83%) with the statement "credit rating data banks are a worthwhile use of computers," they showed the lowest percentage (64%) in feeling that computers will improve education. In comparison, the administrators in this survey were more positive (96%) as were the youth (84%) and the adults (87%) in the original survey.

The comparisons of the groups on specific issues are presented below and in the tables. In all cases adults and youth refer to these groups as defined in the *Creative Computing* survey and the percentages for these populations are drawn from that source.

Computer Threat to Society

Teachers appear to feel that computers dehumanize society by treating everyone as a number (55%) to a much greater extent than do adults (37%), youth (40%) or administrators (26%). They are also the strongest group (30%) in feeling that "computers isolate people by preventing normal social interaction among users" in comparison with administrators (15%), adults (19%) and youth (21%). They were more in line with the other groups in holding the belief that "a person cannot escape the influence of computers" (80%), falling in between the adults in the general population (92%) and the youth (67%). The administrators, in this case, paralleled the general adult attitudes (92%). There was a great deal of consensus between the groups on "computer polls and predictions influence the outcome of elections" with teachers strongly agreeing and agreeing 48%, adults 48%, youth 44% and administrators 52%.

Understanding of Computers

Teachers may be more willing to blame machines for errors, and less willing to blame human beings. They were much more agreeable (30%) to the statement that "computers make mistakes at least 10% of the time," while no other group exceeded 10%. When it

David Lichtman, Ed.D., University of South Carolina, Columbia, SC 29208

TABLE 1

COMPUTER THREAT TO SOCIETY

	PUBLIC ATTITUDES				EDUCATOR'S ATTITUDES			
	ADULT N=300		YOUTH N=543		TEACH N=162		ADMIN N= 27	
ITEM	SA &A	SD &D	SA &A	SD &D	SA &A	SD &D	SA &A	SD &D
A person today cannot escape the influence of computers	92%	4%	67%	18%	80%	6%	92%	0%
Computer polls and predictions influence the outcome of elections	48	27	44	27	48	24	52	18
Computers dehumanize society by treating everyone as a number	37	50	40	31	55	22	26	48
Computers isolate people by preventing normal social interactions among users	19	62	21	42	30	33	15	74

SA&A = Strongly Agree and Agree
SD&D = Strongly Disagree and Disagree

Public Attitudes data from Ahl's "Survey of Public Attitudes Toward Computers in Society," 1975.

TABLE 2

UNDERSTANDING OF COMPUTERS

	PUBLIC ATTITUDES				EDUCATOR'S ATTITUDES			
	ADULT N=300		YOUTH N=543		TEACH N=162		ADMIN N= 27	
ITEM	SA &A	SD &D	SA &A	SD &D	SA &A	SD &D	SA &A	SD &D
Computers are beyond the understanding of the typical person	25%	62%	31%	49%	30%	47%	33%	52%
Computers make mistakes at least 10% of the time	10	77	10	60	30	38	7	70
Programmers and operators make mistakes, but computers are, for the most part, error free	67	19	72	13	55	25	70	15
It is possible to design computer systems which protect the privacy of data	60	26	49	16	46	18	70	18

TABLE 3

UNDERSTANDING THE ROLE OF COMPUTERS

	PUBLIC ATTITUDES				EDUCATOR'S ATTITUDES			
	ADULT N=300		YOUTH N=543		TEACH N=162		ADMIN N= 27	
ITEM	SA &A	SD &D	SA &A	SD &D	SA &A	SD &D	SA &A	SD &D
Computers are best suited for doing repetitive, monotonous tasks	80%	10%	57%	22%	54%	17%	41%	30%
Computers are a tool, just like a hammer or lathe	73	15	61	23	77	8	81	15
Computers slow down and complicate simple business operations	18	66	17	69	12	69	11	81
Computers will replace low-skill jobs and create jobs needing specialized training	71	15	62	14	36	22	52	15
Computers will create as many jobs as they eliminate	62	16	40	29	35	30	44	26

came to the statement that "programmers and operators make mistakes, but computers are, for the most part, error free," however, they were much less in agreement (55%) than were the administrators (70%), the adults (67%) or the youth (72%).

The concern for privacy in relation to computers and data banks is a growing one in our society. Of all the groups, teachers seemed to agree least that "it is possible to design computer systems which protect the privacy of data," with only 46% able to strongly agree or agree with this statement. The only comparable group were the youth (49%), while the adults (60%) and the administrators (70%) were stronger in their feelings that this could be achieved.

All of the groups held about the same views that "computers are beyond the understanding of the typical person," with the possible exception of the adults whose dissenting view (strongly disagree and disagree) was stronger (62%) than the youth (49%), teachers (47%) or administrators (52%).

Understanding the Role of Computers

Teachers, interestingly enough, seem to be the most dubious about the idea of computers replacing low-skill jobs and creating jobs needing specialized training with only 36% agreeing or strongly agreeing with this statement. The other groups were more uniform in their response pattern, with agreement among 71% of the adults, 62% of the youth and 52% of the administrators. The teachers were also the least affirmative of the statement that "computers will create as many jobs as they eliminate," with only 35% replying in the affirmative as compared with 40% of the youth, 44% of the administrators and a high 62% of the adults.

Computer Impact on the Quality of Life

Teachers and administrators were both higher than the general population in the apparent belief that "credit rating data banks are a worthwhile use of computers," with teachers in agreement 83% and administrators 85%, as contrasted with both the adults and youth at 64%.

On the other hand, the teachers were consistently lower in their other replies in this category, while, with one exception, the administrators were consistently more positive than the general population. In the area of improvement of health care, the teachers and the youth were affirmative in 51% of the cases, while there was agreement on the part of 67% of the administrators and 79% of the adults. Only 60% of the teachers subscribed to the idea that "computers will improve law enforcement," while 70% of the youth, 82% of

the adults and 89% of the administrators did.

The last statement in this section was, perhaps, the most interesting since it, "computers will improve education," was the most germain. Only 64% of the teachers responded in a positive manner, a figure which was much overshadowed by all of the other groups: adults (87%), youth (84%) and administrators (96%).

Additional Issues

Six statements which were not on the original public attitudes survey were included on the current one. Two of these were general in nature, and four were more directly related to the educational environment than were any of the statements in the original survey.

"Our country would be better off if there were no computers" drew a negative vote (disagree and strongly disagree) from 78% of the teachers and 100% of the administrators. An interesting possibility, "someday I will have a computer, or a computer terminal, in my home," was affirmed by 20% of the teachers and one-third (33%) of the administrators.

In light of some of the other negative expressions, it is nice to note that over one-third (36%) of the teachers felt that "if there was a computer terminal in my classroom it would help me to be a better teacher," while almost half (48%) of the administrators also agreed. On this statement, incidentally, only 22% of the teachers were in disagreement.

Fifty-eight percent of the teachers felt that "computers can teach mathematics," while 52% of the administrators agreed. That a computer is still regarded more as a mathematical tool than a universal symbol manipulator was probably inherent in the fact that a smaller percentage (47%) of the teachers felt that "computers can teach reading." The same percentage of administrators (52%) stayed with reading as did with mathematics.

TABLE 4

COMPUTER IMPACT ON THE QUALITY OF LIFE

	PUBLIC ATTITUDES				EDUCATOR'S ATTITUDES			
	ADULT N=300		YOUTH N=543		TEACH N=162		ADMIN N= 27	
ITEM	SA &A	SD &D	SA &A	SD &D	SA &A	SD &D	SA &A	SD &D
Credit rating data banks are a worthwhile use of computers	64%	13%	64%	8%	83%	4%	85%	4%
Computers will improve health care	79	5	51	12	51	14	67	4
Computers will improve law enforcement	82	3	70	10	60	10	89	7
Computers will improve education	87	6	84	5	64	9	96	0

TABLE 5

ADDITIONAL ISSUES

	PUBLIC ATTITUDES				EDUCATOR'S ATTITUDES			
	ADULT N=300		YOUTH N=543		TEACH N=162		ADMIN N= 27	
ITEM	SA &A	SD &D	SA &A	SD &D	SA &A	SD &D	SA &A	SD &D
Our country would be better off if there were no computers					5%	78%	0%	100%
If there was a computer terminal in my classroom it would help me to be a better teacher					36	22	48	15
Someday I will have a computer, or a computer terminal, in my home					20	43	33	26
Computers can teach mathematics					58	16	52	15
Computers can teach reading					47	20	52	15
A computer may someday take my job					16	67	22	59

Conclusions

This study does not purport to represent any in-depth analysis of educator's attitudes towards computers. At best it is a rather superficial overview of one group in this area. If we can assume, however, that it does indicate some possible trends or expectations they might be as follows:

1) That teachers view computers in a much more dehumanizing and isolating manner than do other segments of the population; especially school administrators.

2) That teachers do not feel secure in their relationships with computers, particularly in regard to privacy of data and mistakes, while administrators are more confident in these areas than are the general population.

3) That both teachers and administrators are more wary of computers in relation to jobs and skills (except their own) than are other people, with teachers much more concerned than administrators.

4) That a smaller number of teachers see improvement in the quality of life through the use of computers than do others and that they see the least improvement in education of any group, while the administrators are overwhelmingly positive in this regard.

5) That while teachers seemed concerned about the computer's effect on jobs in general, few were concerned about their own jobs being taken away (although the possibility inherent in the administrator's responses concerning computers teaching reading and mathematics and their much more positive attitude that computers will improve education may begin to concern them).

We have had prognostications of great changes being wrought in education due to the computer, and predictions that computers will alter schools. If this study is indicative, it may be of the possibility that a lot of computers may be bought (by administrators) but they may not be used, at least to any greater proportion than the other existent tools of educational technology. ■

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CIRCLE 128 ON READER SERVICE CARD

Random Ramblings

John Craig

Come along for a trip to the Silicon Valley and some of the latest developments in the personal computing industry.

San Francisco is one of my favorite places. Unfortunately, I don't get a chance to get up there as often as I'd like. However, I did manage to take a few days off recently and get up to the Silicon Valley and visit some interesting people and companies. Come on along and I'll share the trip with you.

I stopped by one of the "old-timers" in our industry, Cromemco, and some of the "new-comers" such as Exidy, Altos Computer Systems and The Software Works. I always try to catch the monthly meetings of the Homebrew Computer Club when I'm in the bay area and one of the hightlights of this trip was their meeting. It's a great place to catch up on the latest rumors!

Cromemco

For as long as I can remember, Cromemco has had a reputation for making the "Cadillac" of S-100 systems. After you've seen how they test their machines you'll realize, as I did, just why they're so good! Testing is the name of the game and I haven't run across a company in this industry that tackles it quite like Cromemco.

Photo 1. Cromemco's new plant, located on the corner of Bernardo Avenue and Central Expressway, Mountain View, California.

Another thing that impressed me was the use they make of their own systems (particularly the System Three) in running their company. They're all over ... and they're not doing "small business" computing, they're doing medium-sized corporation computing! And doing it well.

Harry Garland, the President of Cromemco, gave me the tour of his new plant (located at 280 Bernardo Ave., Mountain View, CA 94040 - see Photo 1). At the beginning of our trip through the manufacturing area he mentioned that Cromemco was listed as #1 in reliability in the latest report

Photo 2. Dr. Harry Garland, Cromemco's President and founder, standing in front of one of their five burn-in ovens. Their 16K memory boards are left in there for a full week! (Other boards get a little slack and get out sooner.)

from Image Resources ... and he has every intention of making sure his company stays there. The burn-in ovens, shown in Photo 2, are one way he's achieving this. There are five of those ovens and each one holds 3 card cages. The system on the table (lower right) is used for testing the boards while they're being burned in.

Photo 3 shows the new component and subassembly test station which was being installed while I was there. Very expensive, very impressive ... but it uses someone else's computer! As we were walking past the systems in the final test I noticed some cardboard

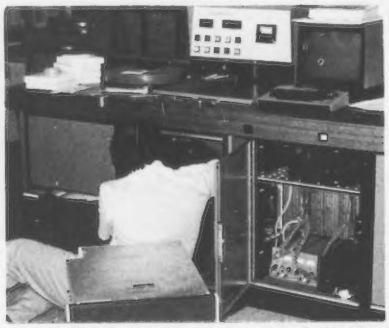

Photo 3. Cromemco's new component and assembly test station. Is that a PDP-11 waiting for installation there?

over the card cages of the systems being tested (see Photo 4). Harry pointed out that the cardboard was being used to block off the air flow! The boards were extremely hot and the systems are put through this torture for forty-eight hours!

They had one of their time-share systems in burn-in, also. Their System Three Multi-User configuration will support from 2 to 7 users ... each with 32K of memory maximum. (Later on I saw one of these systems in actual use in the Sales Department. The system was used for getting instantaneous stock information and other info for dealers and salesmen.) They've also

developed an impressive multi-user Basic to go with the system (which should make it very attractive to educational institutions).

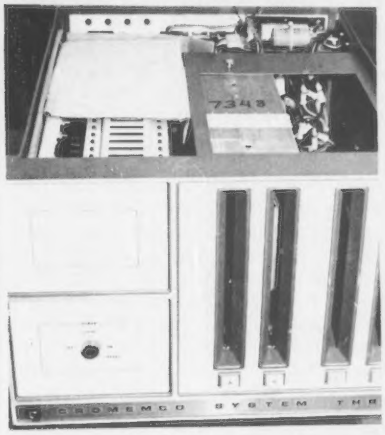

Photo 4. That cardboard over the card cage is completely blocking the air flow to those boards ... for 48 hours! Try that with your system ... for 2 hours!

Photo 5. How many other companies do you know of who are offering any kind of time-share software? Not many, right?

As I mentioned before, the actual use of Cromemco systems throughout the plant is very impressive. It's very difficult to find an office without one. They're used in the development labs, stock room, test stations, for preparing all system documentation using Cromemco's Word Processing System. The company's inventory control system is shown in Photo 6. When I hear the word inventory I immediately think of disk capacity. The System Three has four 8 inch Per Sci disk drives for 1 Megabyte of on-line mass storage (and double-sided, double-density systems are coming up!) Photo 7 is just one of the seven time-share stations set up in the sales area for handling dealer and customer inquiries. I've actually visited other companies, such as Cromemco, which used minicomputers to handle jobs like this!

So much for the hardware and why they have one of the most enviable reputations in the industry. We all know that you can't do anything with just hardware ... software sure comes in handy! You name it, they've got it! Their system runs under CDOS which is a modified version of CP/M. (We'll find out if their software will run under a standard CP/M system upon receipt of a copy of their Data Base Management package for review in an upcoming issue of Creative. The program allows you to custom design data bases for everything from general ledger to mailing lists.) Along with their Multi-User Basic they have Fortran IV, Cobol, 16K Extended Basic, a Word Processing system and more.

Photo 6. The system that handles the inventory for Cromemco's entire operation. What better testimony of the faith they have in their own product?. (Where are those critics who keep screaming that micros can't handle jobs like this!!?)

Photo 7. All the information a salesman needs concerning delivery dates for systems being manufactured, off-the-shelf availability, prices, discounts, and more ... right at his fingertips!

Reliable hardware and software are the cornerstones for a successful business system. If you're in the market for a system ... take a close look at the "Cadillac" in your shopping around.

Photo 8. You've undoubtedly heard of Dr. Alice Ahlgren, Cromemco's Marketing Vice-President? This obviously unposed photo shows her in the midst of getting material together for a course to be presented to Cromemco dealers. This kind of dealer support is very important to a potential customer! There are simply too many companies in this industry who leave the dealers out there in left field to "go it alone."

The Software Works

My next stop was a visit to Dick Milewski and his software generating factory called The Software Works ... also located in Mountain View (P.O. Box 4386, Mt. View, CA 94040). One of Dick's latest "enterprises" is putting together a monthly column in Creative Computing for your enjoyment. The column is called the Apple Cart and is devoted to Apple owners and those thinking of buying an Apple. Dick just recently got into doing software development for the Apple. In the past he has developed some fine applications software for North Star systems. These include Mailroom (an interactive mail list maintenance package), Inventory I (a 940-item package which can be upgraded to larger inventories — Inventory II and III). Housekeeper (a collection of North Star utility routines) and Fix-It (for running North Star Version 3 programs under Version 4 Basic). His latest creation is P/M Planner, a capitol equipment inventory system with preventive maintenance scheduling.

Everybody and his brother seems to be jumping onto the software development/marketing bandwagon these days. It looks like an easy way to make a living ... and perhaps for the less diligent it is. I say that because I

was particularly impressed with the customer support Dick provides (i.e., he is diligent). I guess he spends his evenings developing software because it sure didn't look like he had much time for it during the day! He was on the phone constantly and it seemed like many of the callers were customers without much background. His patience in handling some obviously unnecessary questions was remarkable. The best part was when he would gently try to guide the person back to the manual ... which is where the answer was all along.

I always seem to have an excuse when I've blown it on getting pictures of someone or something. This is no exception. My flash unit wasn't working while I was at the Software Works ... but I didn't know it at the time! Anyway, there ain't no photos of handsome Dick and his Imsai/North Star and Apple disk system. (It's airight, you aren't missing that much!)

The Homebrew Computer Club

The meeting I attended was relatively skimpy in the attendance department ... as you can see from Photo 9. (I'll bet there are dozens of clubs all over the country that would give their left arms to have attendance like that!) There's usually standing room only ... with the auditorium (at the Stanford Linear Accelerator Lab) filled with close to 300 bodies. This particular evening there were approximately 110 people there.

I was invited to say a few words to the group and foolishly stepped down in the pit where they throw the Christians (and Lee Felsenstein, who runs the show and is one of Creative's Contributing Editors). I figured I'd get the jump on them and ask some questions before they had a chance to put me on the spot with theirs. I asked for a show of hands of how many people had CP/M up and running on their systems. I was astounded when about 90 of those 110 hands went up! I then asked how many were interested in Pascal and/or planned on getting it up on their systems. It looked like the same number of hands went up. Very interesting.

Photo 9. A rare, unretouched photo of a Homebrew Computer Club meeting.

Later on in the meeting someone mentioned that he had a Texas Instruments Speak & Spell that he'd like to sell. He had brought it with him and someone asked him to "play it" for the group. The room was completely still while he made that thing talk for us. It was incredible! If you haven't heard one you're missing one of the truly astonishing developments in technology today! The chip which generates the speech is a special version of the TMS1000 (an 8-bit micro) working with a pair of 128K ROMS. The circuitry is capable of producing over 200 words but can access a lot more memory for more words — as much as 2.1 megabytes! (I understand TI has been swamped with inquiries from people interested in just the synthesizer chips.) As I listened to the thing it suddenly dawned on me that TI will most certainly have the same synthesized speech capability in their upcoming personal computer. You wait ... TI's talking computer is on the way!

Altos Computer Systems

Here are some folks who have some good things going! They've put together a Z80-based computer with 64K of RAM, a dual disk controller (double-sided, using DMA), 1 parallel and 2 serial I/O ports ... all on one board! Feast your eyes on Photo 10 and see what it is I speak of! I have spent more hours (make that, days) of my life troubleshooting computers and electronic equipment than I care to think about. This 1-board concept is going to be the field technician's, or perhaps even the end user's, dream. The single board, with all the goodies I mentioned, is on the far right. The electronics you see on the left is for the left Shugart disk drive. Since the drives are double-sided, those clever devils at Altos mounted them upside down ... so the electronics would be easily accessible for troubleshooting. So, there it is ... 2 disk drives and their associated electronics, a power supply, a fan and a board with the CPU, I/O and memory. Put that together with a terminal and a printer, and you've got it!

Photo 10. The Altos Sun-Series 8000 system. One of the remarkable things about their single board is that it looks like they had room left over!

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I hinted a moment ago about the possibility of the end user being able to troubleshoot and repair this system. If he had a spare board on hand, and the ability to unplug and plug in a few connectors, I'm not so sure that kind of repair would be far-fetched. If, on the other hand, the repair was taken care of by a qualified technician this simplified concept would certainly make his job easier ... and the customer happier because of reduced down-time.

Altos has really pushed the fact they have a Pascal-based system and apparently it's paying off. 30% of the systems they've sold have been ordered with Pascal! Another plus in

Photo 11. Dr. Roger Vass, Altos' man of the hour ... and Marketing VP. He's very interested in hearing from qualified distributors and OEMer's. (Their system isn't going to be sold through conventional computer stores.)

their software department is the fact the system runs under CP/M. They're also offering CBASIC, Fortran IV, Cobol, a Macro-Assembler and business and word processing packages. They have an optional Floating Point Processor (the AMD 9511) which has been interfaced to BASIC-E and Pascal.

Altos' Marketing Vice-President, Roger Vass (shown in Photo 11), and the President, David Jackson, gave me the grand tour of their plant ... which they'll be leaving shortly because of growth! (I love the sound of that ... it sure beats hearing about a company that folded!) Altos Computer Systems, 2378B Walsh Ave., Santa Clara, CA 95050.

Exidy's Sorcerer!

And, speaking of CP/M ... who do you suppose is adding it to their system? If you take a close look at Photo 12 you'll see Lori Barrick (head of Exidy's Sales Department) and ... a couple of Micropolis disk drives in the upper right-hand corner. CP/M on Micropolis, for the Sorcerer ... it's coming. Just remember you heard about it first in Creative Computing, okay?

Photo 12. Lori Barrick, together with the Sorcerer and all its new, upcoming accessories.

But, that's not all ... there's more! Do you see the box the cable for the disk drives is coming out of? There you have Exidy's new S-100 expansion for the Sorcerer which consists of a 6-slot mother board and power supply (for around $299). That expansion will allow a Sorcerer to be expanded to 64K of internal memory, among other

Photo 13. One of the reasons Exidy developed a system with such fantastic graphics is because they were developing video games before computers ... and already had the techniques down pat! This is one of several games available for the employees to play during breaks (rough life, huh?)

things. They're also finishing up development of a color TV interface board and an assembler/editor. Oh, yes, and Electric Pencil will also be available on one of their future ROM Pacs.

I was talking to Tony Gold, of Lifeboat Associates (the folks who have done a lot with CP/M and Micropolis), and he mentioned that the

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Sorcerer, unlike the other popular consumer systems, put their ROM in high memory. This means adding CP/M is going to be much easier and not require a lot of manipulating and trying to "make things work" ... sometimes referred to as "Mickey-Mousing." These people have really got their act together. They've got a graphics capability that surpasses that of the other popular systems ... they've got a good, comfortable ASCII keyboard ... and, they've got an S-100 based system which means lots of low-cost boards are available to the buyer. Exidy, Inc., 969 W. Maude Ave., Sunnyvale, CA 94086.

Technology Assessment of Personal Computers

In October of 1977 I was invited to sit on the advisory board for a research team at the University of California. The research is an assessment of the impact personal computing systems will have on our lives in the years to come. The final report will be a book which should be of value to both hardware and software developers in our industry, educators, government personnel, retailers and others. One of the objectives is to try and make sure the material will not become dated a short time after release.

Over 500 6-page questionnaires were handed out at the 3rd West Coast Computer Faire. These questionnaires will provide some of the most important information in the study. The response (i.e., the questionnaire response) was extremely good.

As you can see from the photos the Advisory Board and USC Research Team are made up of some pretty top-flight talent. Two members I didn't get a photo of were John Ratliff, former General Manager of Tandy Computers and Terri Gray, Undergraduate Research Assistant in market analysis. Please extend a helping hand if these folks call on you for assistance in this research, okay?

Radio Shack Update

From what I've heard (since I didn't make it there) the International Microcomputer Exposition in Dallas, Texas (Sept 29-Oct 1, 1978) was somewhat of a flop. However, those attendees who were able to make it over to Radio Shack corporate headquarters for a sale they were having made out like bandits! You may recall seeing a catalog from Tandy Computers last year which contained systems and peripherals from practically every company in this industry. Somewhere along the line a decision was made not to carry all those other computers (and drop the name Tandy Computers ... and go with Radio Shack Computer Centers ... many of which will be springing up around the country). Radio Shack unloaded all those systems, practically at cost, at a tremendous sale held during the weekend of the Dallas show. Wish I could have been there!

Charles Tandy, the man behind Tandy Corporation, passed away on November 4th, 1978. He certainly took a giant step with Radio Shack by introducing the TRS-80 to the American public. I heard a story that he decided on the $599 price for the first models "to find out if the market was there." If not, he had every intention of bailing out in a hurry. It's certainly nice that that market was there!

Microsoft Happenings

The folks who developed the standard BASIC in our industry have decided to pull up stakes from Albuquerque, NM and resettle in Seattle (up in God's country, right?). They should be making the move sometime at the beginning of 1979.

We just received a copy of Microsoft's Cobol-80 for review in Creative. This should be a blockbuster review because we've also got CIS Cobol from Micro Focus, Ltd., London England ... and, permission from both companies to review the packages side by side!

If there's any one factor that is going to make the 16-bit microprocessors get off the ground and really fly it's probably going to be Microsoft's BASIC. They've just about finished the Intel 8086 version and have started on the Zilog Z-8000 version. The BASICs will be upward compatible with the 8080 and Z-80 versions in current use.

Zip Code Woes

Did you hear about the recent proposal which came from the U.S. Postal "Service"? They're talking about adding an additional 5 digits to the zip code to enable the mailroom to determine the exact address a letter goes to. In the event this should be put into effect someday the staff of Creative Computing extends its heartfelt sympathy, in advance, to the thousands of programmers all over the country who will have to modify practically everything! I'd be willing to bet that not more than 2% of the software developed in this country makes allowances for easily changing the zip code!

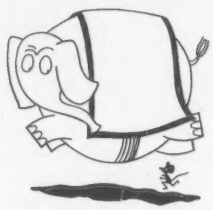
Forth is Here!

With the ever-increasing interest in structured languages you 6502 owners (and others) will be happy to know that an inexpensive version of Forth, called StandardForth (tm), is available from Seawell Marketing, Inc., PO Box 17006, Seattle WA 98107. It will run on a KIM or SYM (VIM) micro and sells for $100. Versions for other micros are coming ... and we'll see if we can get this reviewed in an upcoming issue of Creative.

New Bedfellows: Chip Makers and Game Manufacturers

Mattel's project to produce a home video computer using the new General Instrument chip set has run into the usual unexpected snags. The GI chips are fascinating — one is the CPU, a second contains a video map of the color picture, and the third controls all of the I/O.

Milton Bradley and Texas Instruments are working on a game computer that may be introduced by M-B in mid-1979.



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While other companies keep telling everyone how they are planning to expand and grow, at *Creative* we just keep a low profile while we grow like a weed in a compost heap. In any event, we have purchased a second building in downtown Morristown a couple of blocks off the central "green" (or town square). It's across the street from the "Y" and backs up to Morristown High School. It's 12 rooms nearly double our office space and give us some breathing room (for the moment, at least) for the sixteen (yes, 16!) computers in our Software Development Center.

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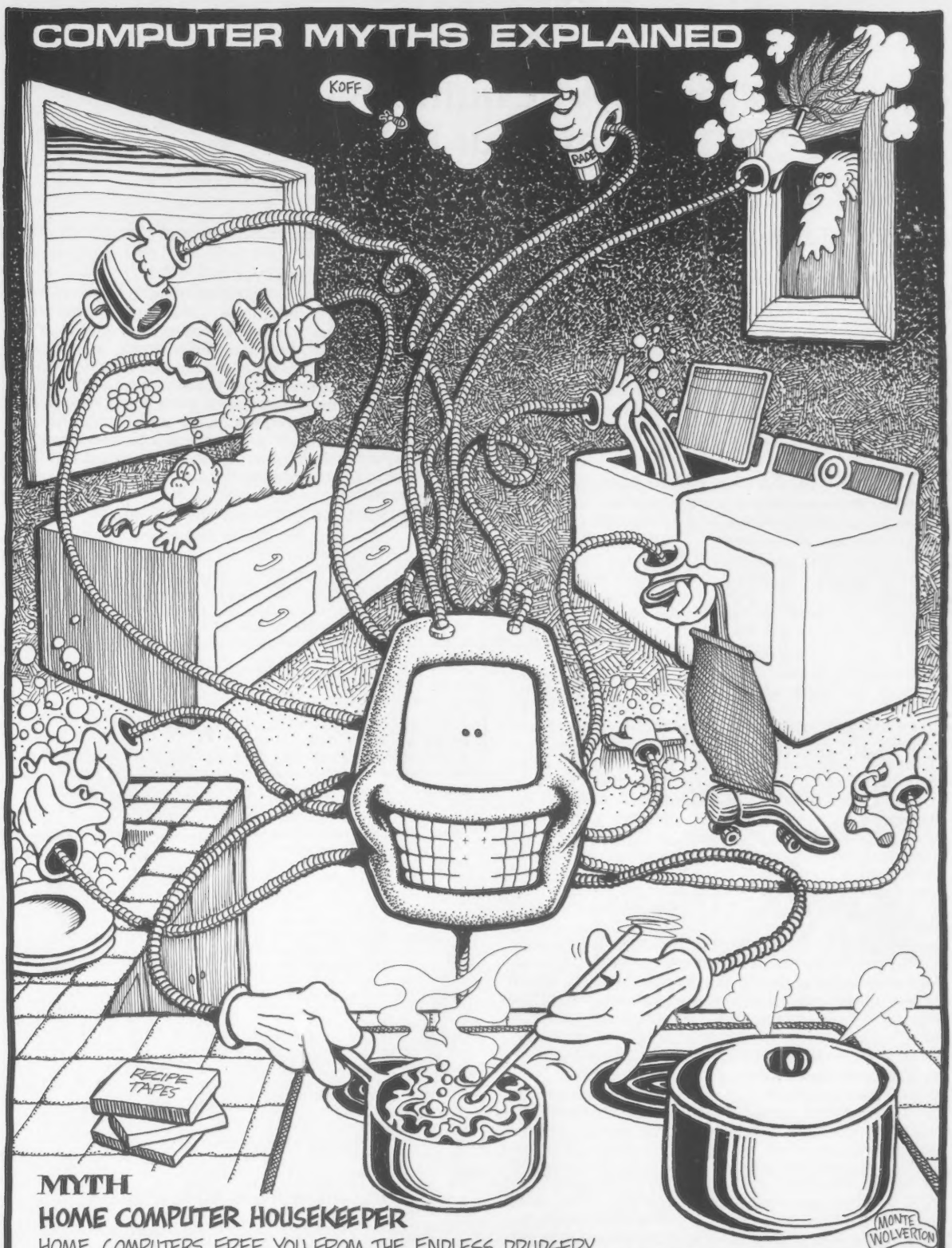

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How About A "Counterfeit Cursor" For Your PET?

Ralph Wells

If you've tried to write interactive programs for your PET, you've probably been plagued with the *Commodore curse* of secrecy. Things that are relatively easy to program when you have a well-documented monitor system such as APPLE II, KIM or VIM become nightmares on your PET. My personal aggravation with Commodore's policy of no-system-documentation increases every time I find some addditional clues as to the software power that's hidden under their shroud of secrecy. The latest case-in-point is cursor control—or the lack of it.

An Accursed Cursor

After a lot of detective work, I developed an algorithm which says that the cursor's position address (decimal) is at (PEEK (225)× 256) + PEEK (224) + PEEK (226). The line (0 - 24) number (on the screen) is ((PEEK (225) × 256) + PEEK (224) - 32568) ÷40, and the position on the line (0 to 39) is PEEK (226). The problem lies in the fact that the only time the PET's cursor is visible is during an INPUT command or in the DIRECT mode. In either case, you have to hit RETURN to get back into your program. This automatically moves the cursor to the start of the next line.

The Interactive Cursor

One of the fundamentals of interactive programming with a CRT is using the cursor to identify data points on the screen. Some of the "drawing" programs use this feature to position graphics, but this is an output function. True interactive cursor control requires that it be used as an input also. When you can position the cursor anywhere on a "game board" screen display and have it detect the character it is "pointing to," then you have a whole new input function for game playing. Describing the next move in checkers or tic-tac-toe using cartesian coordinates and a keyboard is no problem for a computer hobbyist, but what about the kids? Isn't it more practical just to "point" to things with a cursor? In business and control applications, the screen can be filled with choices and the user can point to his choice on the menu using the cursor. In my case, I had a matrix of numbers to verify. If an error was found, it had to be corrected, not only on the screen but also in the running program. A similar requirement had been met with interactive cursor control on our two-year-old SPHERE, and my TRS-80 has a 'point' function, so why not do it on the up-to-date PET? Curses! Foiled again.

Try a Counterfeit

I'm certain that there must be a way to do it better with PET's own cursor, but after several hours of trying to decode Commodore's secrets, I gave up and wrote a program to counterfeit the cursor. It worked (for my application) as subroutines in a larger program. I expect to use the same routines again (probably in Backgammon), so I broke them out into the demonstration program listed herewith. It blinks like a cursor, it moves like a cursor, but it's a phony. The original cursor is completely independent and invisible.

Ralph Wells is Engineering Vice-President of Inmarco, Inc., 7655 Sunset Blvd, Hollywood, CA 90046

What You See ... Is What You Get

The program was never intended to run as anything but a showcase for subroutines. The object was to demonstrate a practical visual method of getting x/y coordinates (memory address) and character identification. What the programmer *does* with this information is his business, so the elements of this program are intended to be broken up into subroutines for the larger endeavor. When you RUN this program, you'll get a cursor in the upper (home) position. It can be moved with the up/down, left/right and home controls, as is the real cursor. Lines 90 and 95 print out the character value (CH), line number (LN) and character position (CP) of the cursor. Note that this is *not* the same as the algorithms mentioned earlier,

```
10 REM ARTIFICIAL CURSOR
20 HM=32768:C1=HM:C2=HM
25 REM HOME IS THE UPPER RIGHT CORNER OF THE TV SCREEN.
27 REM C1 AND C2 ARE THE "CURRENT" AND "NEXT" CHARACTER POSITIONS.
30 CH=PEEK(C1):BC=CH
35 REM CH IS THE CHARACTER # UNDER THE "CURSOR".
37 REM BC IS THE BLINKING CHARACTER.
40 LN=INT((C1-HM)/40)
45 REM LINE NUMBER DOWN FROM TOP(0).  40 SPACES TO CLEAR TOP LINE.
50 CP=(C1-HM)-(LN*40)
90 PRINT""
95 PRINT "CH=";CH;"LN=";LN;"CP=";CP
97 REM PRINTS CHARACTER AND POSITION OF "CURSOR"
100 REM GET CURSOR CHANGE
110 GET C$:REM SCANS KEYBOARD.
120 IF LEN(C$)=0 THEN C=0:GOTO 200
123 REM IF NO KEY PRESSED -- GO BLINK.
125 C=ASC(C$):REM CHECK FOR "CURSOR CONTROL" KEY INPUT.
130 IF C=29 THEN C2=C1+1:REM RIGHT >
135 IF C=157 THEN C2=C1-1:REM LEFT <
140 IF C=17 THEN C2=C1+40:REM DOWN \/
145 IF C=145 THEN C2=C1-40:REM UP ^
150 IF C=54 THEN C2=C1+1:REM RIGHT "6"
154 IF C=56 THEN C2=C1-40:REM UP "8"
155 IF C=52 THEN C2=C1-1:REM LEFT "4"
160 IF C=50 THEN C2=C1+40:REM DOWN "2"
162 IF C=55 THEN C2=C1-41:REM UP+< "7"
164 IF C=57 THEN C2=C1-39:REM UP+> "9"
170 IF C=49 THEN C2=C1+39:REM \/+<"1"
175 IF C=51 THEN C2=C1+41:REM \/+>"3"
180 IF C=19 THEN C2=HM:REM GO HOME
190 IF C=13 GOTO 500:REM "RETURN" KEY? -- GO CHANGE CHARACTER
200 REM BLINK CURSOR
210 IF BC>127 THEN BC=BC-128:GOTO 299
215 REM IF CURSOR IS INVERTED, NORMALIZE
220 BC=BC+128:REM IF NORMAL, INVERT IT
230 T2=TI+1:REM SET UP BLINK RATE
240 IF TI<T2 GOTO 240:REM WAIT FOR BLINK
299 POKE C1,BC:REM PUT OUT CHANGED CURSOR CHARACTER ON TV SCREEN
300 REM FIND NEW POSITION
310 IF C2=C1 GOTO 100:REM IF NO CHANGE, CHECK KEYBOARD
320 POKE C1,CH:REM RESTORE ORIGINAL CHARACTER IN "OLD" POSITION
340 C1=C2
350 CH=PEEK(C2):REM GET NEXT CHARACTER FOR NEW CURSOR DISPLAY
360 BC=CH:REM SET NEXT "BLINK CHARACTER"
399 GOTO 40
500 REM REPLACE A CHARACTER
510 GET CR$
520 IF CR$="" GOTO 510
530 CR=ASC(CR$)
535 IF CR<96 AND CR>63 THEN CR=CR-64
540 POKE C1,CR
550 GOTO 30
READY.
```

which work for the real cursor. Lines 230 and 240 provide a variable blink rate. Increasing the number added to TI in line 230 will slow the blink down. Eliminating both lines gives the fastest blink and highest response speed.

Alternatives In Movement

Lines 130 and 145 provide the "normal" cursor controls. If the number keys are not going to be used for special programming, then they can be used to augment or replace these 'blue' control keys. Lines 150 to 175 use the number pad to provide cursor control in 8 directions without use of the shift key. This diagonal movement capability (using 1, 3, 7 and 9) speeds up the cursor movement. Note that if the "replacement" technique is used (500 to 600), the numbers revert back to their normal functions.

Send In a Replacement

Once the cursor has located the desired location, it can alter it or jump back into some other program by using the RETURN key. Line 190 jumps to the "replacement" routine when #13 (RETURN) is detected, so that the blinking position is changed to the next character entered. Since C1 contains the address of the "cursor," other programming is possible at the same time. LN contains the screen line number and CP has the character position on that line (vertical row position). C2 contains the "old" character and C1 the "new" one, so the input is completely defined.

Things The Commodore Didn't Tell You

To "GET" a character from the keyboard, you can test for either the value (line #520) or the length (line #120) and loop back to GET if it is null (no key pressed), until you get an input. The numeric values obtained from a GET converted to ASCII (line #125 and #530) are *not* always the same number returned by a PEEK. Each key has six different code numbers. Line #535 corrects for this condition. Constant accessing of the TI function (lines #230, 240) will speed up the clock (TI) slightly. A character can be "reversed" (black/white) by adding and/or subtracting 128 as in lines #210 and 220. The keyboard input is buffered and will hold up to 8 keystrokes (location 525 counts them). This means you can count your "moves" by keystrokes even though the blinking stops while it's moving. ■

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How Good Is Microsoft's Fortran-80?

Dr. Douglas Hogg

Did Microsoft meet, exceed, or fall short of the quality they established with their Basic?

Dr. Douglas Hogg, 36 Calle Capistrano, Santa Barbara, CA 93105.

The most common high level hobby computer language is, of course, BASIC but outside schools and hobbyist environments it is little used. The main languages are FORTRAN, for scientific use and COBOL for business use. Now that a version of nearly standard FORTRAN is available for the 8080/Z80 hobbyists can take advantage of its features. The first part of this article is a review of the general features of FORTRAN. Since most readers are already familiar with BASIC, the discussion includes comparisons with the features and syntax of BASIC. The next two sections describe the use of this specific version of FORTRAN and the timing comparisons.

The Basics of Fortran

The largest difference between FORTRAN and BASIC is that the former is a compiler while the latter is an interpreter. What this means is that the FORTRAN software looks at a statement and translates it into machine code which can then be executed repeatedly with no further action by the compiler. In practice, this translation is done in two steps. First the compiler generates intermediate code and then the linker is used to collect this code and the necessary library routines (more on this later) into a final program. During the execution of the program, the compiler and linker need not be present in the system.

BASIC programs are treated differently. The interpreter examines each line of the program as it is about to be executed and generates machine code. This code is not permanently stored. Thus, if a statement is executed one thousand times, it must be translated one thousand times. This is the reason for much of the speed difference between BASIC and FORTRAN. It also follows that the more features BASIC has, the slower it has to be for some of them as there is a larger command table to be searched.

On a practical basis, BASIC is easier to implement and versions are available which will run in one or two thousand words of memory. In 8K a pretty reasonable version can be written. Microsoft's FORTRAN requires 24K plus storage for the operating system so 32K is the minimum usable system.

One very important feature offered by FORTRAN but not as yet by BASIC is standardization. This version of FORTRAN has all the features of ANSI Standard X3.9-1966 except for complex variables. Complex in this sense does not mean complicated, rather it refers to numbers which have a real and an imaginary part. If this concept is not familiar to you, you will not miss them. This standardization means that programs written on one machine can be moved, *unchanged*, to another type of machine and be expected to work properly. This was the original motivation for the development of FORTRAN and COBOL in the mid 1950's. Anyone who has spent much time translating programs from one version of BASIC into another will appreciate this feature.

Standardization is much more than a convenience as the differences are often much more than changing PEEK to EXAM, to :, and restructuring all the string functions. For instance, there are two extremely subtle points that can cause a BASIC program to completely malfunction even though the syntax is totally correct. The first is the method of handling the following type of statement:

65 IF J=0 THEN LET A=1: GOTO 200

If J=0, all BASICs seem to set A=1 and GOTO 200. However, in North Star BASIC at least, if J≠0 the program goes immediately to the next line, *not* to 200. The effect on the program is considerable. This line is from BULCOW in 101 BASIC COMPUTER GAMES by David Ahl. BULCOW is a marvelous number guessing game, but because of this quirk, the computer gave me two guesses each turn but it changed the number to be guessed each time also. This is not the kind of bug a programmer needs in a complex program. Do you want the business software you buy to have this kind of problem?

The second nonconsistancy is illustrated by the sequence below.

```
100  A=10
105  C=0
110  FOR X=20 TO A
115  C=X
120  NEXT X
```

In this example we have set the end index of the FOR loop less than the starting index without specifying a negative step. In some BASICs, the loop would execute once giving C=20, and in others, zero times giving C=0. Again a very detailed understanding of BASIC and the program is required to track down such problems.

In principle, FORTRAN does not have these kinds of problems. I can go to the University library and get a book of FORTRAN programs and expect them to run without modification. It should be noted that a number of manufacturers have added frills to their FORTRANS which, if used, destroy the portability.

Fortran Instructions

Since most readers are already familiar with BASIC, we'll discuss instructions in FORTRAN along with the nearest equivalent BASIC statement.

INPUT AND OUTPUT. The various forms of the I/O statements are shown below.

FORTRAN	BASIC
READ (5,100) A,B,C 100 FORMAT (3F15.5)	INPUT A,B,C
WRITE (5,100) A,B,C	PRINT A,B,C
WRITE(5,110) 110 FORMAT ('HI THERE')	PRINT "HI THERE"
READ (5,120) B 120 FORMAT (A4)	INPUT C$

First, there are the differences between INPUT and READ, and PRINT and WRITE. FORTRAN also requires a FORMAT statement to tell what form the input or output will be in. In the I/O statement, the device the data is to be sent to or received from, is indicated by the first number inside the parenthesis while the FORMAT statement number is given second. The unit number given in the example, 5, is not the port number. It is the logical unit number assigned by the operating system to a particular device. These logical assignments may be changed in the operating system so that logical unit number 5 can be assigned to the printer, for example, rather than the CRT terminal.

As we mentioned before, the FORMAT statement specifies the form for the input and output. FORMAT statements specify the number of columns, significant figures, spaces and line feeds as well as the type of variable. The F form means floating point (e.g., 123.456). F15.5 means allow 15 spaces for the number with five spaces to the right of the decimal. The E format means exponential (scientific) form (e.g., 123456E01). E15.5 means allow 15 spaces for the number and exponent, using five significant figures. An I format is available which means integer and is of the form I8. If more than one number is to be output per line, a multiplier count can be put in front of the format specifier (5F15.5 means repeat the F15.5 form five times).

For alphabetic output for labels and such there are two forms, the H format and the '' format. The H format is short for Hollerith and is of the form 10H HI THERE?. The number in front of the H indicates the number of characters following the H. This type of format requires care as the wrong count can produce strange looking output. The more common format is 'HI THERE'. In this form all the text between the single quotes is printed. It is too bad that BASIC chose to use double quotes as this provides one more source of trouble for people who use both languages. There are more types of FORMAT statements but there is not room to cover them here.

DO LOOPS—Do loops provide a means of repeatedly executing a specific sequence of instructions. The form of the DO LOOP and the BASIC equivalent, the FOR/NEXT loop are shown below.

```
      DO 8000 I=1,10,2
        :
8000  CONTINUE

      100 FOR I=1 TO 10 STEP 2
            :
      200 NEXT I
```

The DO LOOP execution consists of the following steps: set I=1, execute the statements down to and including statement number 8000, return to the DO statement, set I=3 (that is 1+2) and repeat. When I=11 (9+2), do not execute the intermediate statements but instead go to the next statement after the statement numbered 8000. Note that while statement 8000 is a continue statement, it may be any executable statement except one which transfers control elsewhere. The use of the CONTINUE is convenient since it is easier to insert additional statements into the loop with this construction.

IF STATEMENTS—FORTRAN has two types of IF, the logical IF and the arithmetic IF. The arithmetic IF has the following form:

```
IF (A) 21,22,23
```

where A is some arithmetic statement (e.g., img/2, CD-3, etc.). If A is less than zero, control is transferred to statement number 21. If A equals zero, control is transferred to statement number 22 and if A is greater than zero to statement number 23.

The second form of the IF statement is shown below.

```
IF (A.GT.100) GOTO 400
```

An alternate form is:

```
IF (A.GT.100) B=10
```

In the first case, if A is greater than 100 (.GT. means greater than but more about that later) the GOTO statement is executed. If not, the next line is executed. The second form is similar. IF A is greater than 100, B is set equal to 10 and the program proceeds to the next line. If A is not greater than 100, the program proceeds directly to the next line. Again, an unfortunate difference with BASIC is that it does not use the parenthesis around the argument of the IF statement.

GOTO—GOTO statements are identical in both languages although at least one BASIC requires GOTO to be written as one word while FORTRAN ignores spaces in all but a few instances. BASIC has a conditional GOTO, the ON...GOTO statement which is the same as the FORTRAN statement shown below.

```
FORTRAN   GOTO (10,20,30),J
BASIC     ON J GOTO 10,20,30
```

In each case, if J=1 control is transferred to statement 10, if J=2 to statement 20 and if J=3 to 30.

CONTINUE—CONTINUE is the FORTRAN equivalent of a NOP. It performs no action and is mainly used as a DO loop terminator.

END and STOP cause the program to stop execution and return to the monitor. END must be the last statement of a program.

CALL—The CALL statement followed by a subroutine name is the equivalent of the BASIC GOSUB. Subroutines in FORTRAN and BASIC are different philosophically. More about this difference later on.

Numeric Representation

FORTRAN has two types of numeric representation—integer and floating point. Integers are whole numbers and are represented by variables starting with the letters I-N (from INteger). The internal representation of integers and floating point numbers is done differently. Integers are stored as 16 bit numbers (2 bytes) and thus are limited in range from 32768 to -32767. Integers are used for indexes in matrices, DO loop counters and other situations where fractions are not needed. Integer multiplication is the same as floating point but in integer division the result is truncated. For instance 4/5=0. This form is equivalent to the BASIC INT(4/5). Integer arithmetic is faster. For example, K=K+1 can be equivalent to an increment register machine instruction but A=A+1 (A = floating point) requires several instructions to operate on four bytes of storage.

Floating point numbers are used for most numerical calculations and have a range of 10**38 to 10**-38 with seven significant figures. Double precision is also available, providing the same range of exponents but 16 significant figures instead of seven. Single precision numbers require 4 bytes of storage, three for the mantissa and one for the exponent. Double precision requires eight bytes, seven for the mantissa and one for the exponent. Floating point variables start with the letters A-H and O-Z.

All variable names in FORTRAN may be up to six letters long compared with the one letter and one number allowed in most BASICs.

Both languages have arrays and Dimension statements which are handled in the same way although BASIC uses the abbreviation DIM while FORTRAN spells it out fully.

Arithmetic Functions and Expressions

FORTRAN 80 has a complete set of arithmetic, trigonometric and logical functions. The five standard arithmetic operators and the symbols used are: addition (+), subtraction (-), multiplication (*), division (/) and exponentiation (**). Note that BASIC uses "↑" for exponentiation while FORTRAN uses "**". The basic functions available in both single and double precision are: EXP, ALOG, ALOG10, SIN, COS, TANH, SQRT and ATAN. These are used in the same fashion as in BASIC except that the names are slightly different (which does not protect the innocent).

A useful tool is the set of relational operators. The available FORTRAN relational operators and the BASIC equivalents in parenthesis are: less than .LT. (<), less than or equal to .LE. (<=), equal to .EQ. (=), not equal to .NE. (<>), greater than .GT. (>), greater

than or equal to .GE. (>=). The result of an expression is either TRUE or FALSE. The reason for the leading and trailing periods is so that the compiler can tell the relational operators from the variables. BASIC does not need this type of discrimination since it uses math symbols instead of letters.

Another feature is the set of logical operations. Those available in FORTRAN 80 are .NOT.,.AND., .OR., and .XOR. (Exclusive OR). These operators do logical functions on a bit basis between arguments. As an example, given the operation I= J.AND.K where the binary representations of J and K are 01010101 and 11110000 respectively produces a result I=01010000 binary. That is, the bit in I is 1 if the corresponding bit in J *and* in K are both 1. The notation in BASIC is the same except for the leading and trailing periods.

Mathematical calculations are written in the same format except that the actual results may be a function of the type of variable used. If we say I=4.5, where I is an integer variable the value actually stored in I is 4, since to convert to an integer the decimal part is truncated.

Subroutines

Subroutines are handled differently in BASIC and FORTRAN. In BASIC, the subroutine is part of the main program, has line numbers which follow in sequence from the main program and it has the same set of values for the variables. In FORTRAN, subroutines are independent entities which can have any set of line numbers (line numbers are not required on each statement in FORTRAN) and any names for the variables. The call to a subroutine is of the form:

```
CALL TESTP(A,B,C,D)
```

where TESTP is the name of the subroutine and the variables A, B, C and D are to be passed to and from the subroutine. The form of the subroutine is shown below.

```
SUBROUTINE TESTP (P,Q,R,S)
.
.
.
RETURN
END
```

The variables A, B, C and D in the main program are called P, Q, R and S respectively in the subroutine. This does not effect the values of any variables with the names P, Q, R or S in the main program. The RETURN statement transfers control back to the main program and the last values of P, Q, R and S are placed in storage areas for A,B,C and D.

Functions are a type of subroutine with a slightly different form. The statement A=EXP(B) means: set A equal to the value e**B. This can also be expressed as shown below.

```
MAIN PROGRAM
.
.
CALL SUBR(A,B)
.
.
END
SUBROUTINE SUBR(C,D)
C=2.71828**D
RETURN
END
```

If we have an operation which is repeated and we do not wish to type it a number of times, we can define it as a function or call it as a subroutine. The last example illustrated a subroutine call. To define a function we put in a statement to do so.

```
FADD(A,B,C,D)=A+B+C+D
```

Then when we wish to add four numbers we only have to use the function FADD, as in R=FADD(X, Y,Z,ZZ). This is the same operation as using any of the familiar library functions such as SIN and LOG.

This is an appropriate place to mention the Fortran library. This is a collection of subroutines which we want to call from our FORTRAN programs. We have already given the examples of SIN and LOG but there are many others such as the routines that handle the input and output, absolute value, sign, etc. These routines are selected out of the library by the linker when the final program is being assembled. An extremely useful feature is that you can add your own routines to the library. For instance, if you have a graphics unit or plotter, the driver routines can be placed in the library for use when needed. This addition of files to the library in FORTRAN 80 is done with a program called appropriately enough LIB 80. The routines added to the library can be either FORTRAN subroutines or MACRO routines which have been assembled using M80, the macro assembler included with the FORTRAN 80 package. Microsoft has already added some nonstandard routines to the library such as: POKE (load a memory location), PEEK (examine a memory location), INP (input from an 8080 input port) and OUT (output to an 8080 output port).

The above discussion of the features of FORTRAN 80 is in no way intended to be more than an overview. Many fine books are available to teach FORTRAN.

Operation of Fortran 80

The actual mechanics of getting a program up and running in FORTRAN are considerably more involved than in BASIC. In the following discussion, the operating system is assumed to be CP/M from Digital Research. First the program is entered and corrected using the system editor, ED. This produces a program called NAME.FOR where the name is, of course, up to you and the extension .FOR means FORTRAN source file. Next, F80, the FORTRAN compiler is called. This compilation produces a file called NAME.REL where again the name choice is yours and the extension .REL means relocatable. L80, the linker is then called. It takes the .REL file and links it with the appropriate library modules from FORLIB.REL to produce the final machine code. More details of each step are given below.

F80—This is the compiler and its operation consists of specifying the source and destination file names.The command format is of the form PROG1.PROG2=PROG. The extensions are not given as F80 automatically looks for a file with the extension .FOR and produces files with the extensions .REL and .LST. In the example above the source file is the name to the right of the equals sign. The compiled output is put in to the file PROG1.REL and a listing of the program, the generated code and the error messages is put into a file called PROG2.LST. The names in the example are different just for ease of reference. In practice, all files relating to the source program are given the same name.

The .REL file has been explained but what does the .LST file do? It is generated as a convenience for the programmer so that he can go back and look for any errors which have shown up. In practice, this file does little more than clutter up the disk. Another form of the command is available which lists what would have gone into the .LST file on the terminal. This form is: PROG,TTY:=PROG. Using this form, no .LST file is generated. If you firmly believe there are no errors in your program all you really have to say is: =PROG. This will produce a file PROG.REL and return to the monitor. If you only want to check for errors use the command form: ,=PROG. This provides a list of errors but does not generate either a .REL or a .LST file.

The compiler has an option, specified by a /M at the end of the command line which tells the compiler that the generated code is to be put into a form suitable for ROM. For production of code for dedicated controllers this is a very powerful option as it allows development of applications software in a high level language. There is still the overhead of the run time package to consider, but with memory being cheap this does not matter much anymore.

L80—After all syntax errors are out of the program and a .REL file exists, the linker is called. The linker processes the .REL file, assigns absolute addresses and locates necessary subroutines and error messages. To find the subroutines, the linker looks for names typed in with the program and then it searches the FORTRAN library,

FORLIB.REL, for the remainder of the references. If all necessary subroutines are not located, the system asks the operator for them.

The L80 command structure is: PROG, SUBR/G where PROG is the PROG.REL file produced by F80 and SUBR.REL is any subroutine you need that is not in the library. The /G tells the linker that you wish to execute the program as soon as it is ready. If you wish to save the generated program, type NAME/E/N or NAME/G/N. The generated file will be stored under NAME.COM and the linker will direct control to either the system (with /E) or to the program (with ?g).

While saving a short program, it will probably seem like a lot of blocks are needed. In fact, for a minimum program you will need at least 32 blocks (8K). Why so much? This space is occupied by the runtime package which contains the system subroutines and other material such as error messages and error checking routines.

M80—Included with this package is an assembler called M80. The advantage of this assembler is that it allows the programmer to write assembly language subroutines which can be called from FORTRAN. As a result you get the speed and efficiency of assembly language for the critical parts of the program but you also have the ease of programming in a high level language for the rest of the program. Microsoft also provides the names of the math routines in the FORTRAN library so you can call floating point routines from the assembly language routines. In addition, any utility programs written in assembly language can be included in the FORTRAN library using LIB80, the system library generator.

User Impressions

How useful is it to have FORTRAN? Tremendously. There is so much software written in FORTRAN that this compiler opens many avenues. Time critical programs are very well suited for FORTRAN but the main advantage for the small user is the ability to link up with existing subroutines, especially machine language ones. For instance, driving a vector graphics unit or A/D converter is best done in assembly language but the data setup and processing are a lot more convenient in FORTRAN.

From a user point of view, the biggest annoyance is with the turn around time for correcting errors. In BASIC, a bad statement can be fixed immediately and execution resumed. In FORTRAN, you must go to the editor (the CP/M editor is not very inconvenient), change the program, exit, call F80, compile, call L80, link and run or save. This is, however, heaven compared to the old days of paper tape and the Flexowriter on the CDC 160, but it makes me wonder whether I have just been spoiled or whether BASIC has inspired sloppy habits in my programming. I should point out that this turnaround time is not a function of the quality of the Microsoft software. It is, rather, a result of the fact that there are a lot of operations being done and that floppy disks are not terribly fast.

Speed

Perhaps the most overrated parameter of the hobby computer is speed. There are very few applications where the majority of the computer time is not spent in a loop waiting for operator input. However, the speed advantage of FORTRAN does make possible some of the programs that are not practical in BASIC. For instance, one BASIC chess game which does not even allow the player the choice of color, takes from five to fifteen minutes per move. A FORTRAN version, which plays at a higher level, takes only fifteen to thirty seconds per move. These are the type of programs which are appropriate only for FORTRAN or another compiled language.

KILOBAUD #10 had a comparison of the speeds of most BASICs. In order to compare the speed of FORTRAN, the benchmark programs were rewritten in the nearest FORTRAN equivalents. To keep the same form as BASIC, the DO loops were terminated with CON-

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TINUE statements. One area that could not be made the same is the DO loop indices. FORTRAN uses only integers for these loops, and BASIC uses floating point.

The rewritten benchmarks are shown in Figures 1 to 7. The actual programs had another DO loop around them to give a suitable multiplication factor so I could time them with a watch. The machine these were run on has an 8080 operating at 2 MHz and memory with no wait states. Figure 8 shows the results of the benchmarks. There are two columns for the FORTRAN timings, one for the programs run with integer arithmetic and one for the same program run with floating point variables. Also shown is the time for Microsoft extended disk BASIC ver.4.0 as a comparison of BASIC by the same company with roughly the same number of features.

Benchmark #1 executes about 70 times faster than BASIC. This shows that it takes only a small amount of time to do an integer add 1. In fact, this can be done with an increment register instruction.

```
      PRINT (5,10)
10    FORMAT (' START')
      DO 100 I=1,1000
100   CONTINUE
      PAUSE END
      END
```

Fig. 1. Benchmark #1.

Benchmark #2 was run with the variables named K for the integer version and named AK for the floating point version. The floating point version does run faster, but not much more so than BASIC. The interesting point is the large difference between the integer and floating point versions. This shows that it does indeed take longer to manipulate and add to four bytes of memory.

```
      PRINT (5,10)
10    FORMAT (' START')
      K=0
11    K=K+1
      IF (K.LT.1000.) GOTO 11
      PAUSE END
      END
```

Fig. 2. Benchmark #2.

Benchmark #3 adds an arithmetic expression to benchmark #2. This still executes about ten times faster in integer form and about 2.5 times faster in floating point form.

```
      PRINT (5,10)
10    FORMAT (' START')
      K=0
11    K=K+1
      J=K/K*K+K-K
      IF (K.LT.1000.) GOTO 11
      PAUSE END
      END
```

Fig. 3. Benchmark #3.

Benchmark #4 adds some constants in the math expression. The constants take longer in BASIC to convert but in FORTRAN they are converted by the compiler so little time is added.

```
      PRINT (5,10)
10    FORMAT (' START')
      K=0
11    K=K+1
      J=K/2*3+4-5
      IF (K.LT.1000.) GOTO 11
      PAUSE END
      END
```

Fig. 4. Benchmark #4.

Benchmark #5 adds a subroutine call. The timing shows that a JMP and RET take very little time. A more accurate assessment of the overhead required for a subroutine call would be indicated by passing some parameters to the subroutine.

```
      PRINT (5,10)
10    FORMAT (' START')
      K=0
11    K=K+1
      J=K/2*3+4-5
      CALL DLA
      IF (K.LT.1000.) GOTO 11
      PAUSE END
      END
      SUBROUTINE DLA
      RETURN
      END
```

Fig. 5. Benchmark #5.

Benchmark #6 adds a DO loop in the middle. For BASIC, this increased the time required considerably but in FORTRAN, DO loops are very fast.

```
      PRINT (5,10)
10    FORMAT (' START')
      K=0
11    K=K+1
      J=K/2*3+4-5
      DO 20 IJ=1,5
20    CONTINUE
      CALL DLA
      IF (K.LT.1000.) GOTO 11
      PAUSE END
      END
      SUBROUTINE DLA
      RETURN
      END
```

Fig. 6. Benchmark #6.

Benchmark #7 adds an array to the program. In BASIC, the storage of data in this array takes quite a bit of time, roughly 20 seconds. In FORTRAN, this storage is done in an almost negligible amount of time.

```
      PRINT (5,10)
10    FORMAT (' START')
      DIMENSION M(5)
      K=0
11    K=K+1
      J=K/2*3+4-5
      DO 20 IJ=1,5
      M(IJ)=J
20    CONTINUE
      CALL DLA
      IF (K.LT.1000.) GOTO 11
      PAUSE END
      END
      SUBROUTINE DLA
      RETURN
      END
```

Fig. 7. Benchmark #7.

The main results of the benchmarks are to show that, as expected, FORTRAN is roughly a factor of ten faster for a complicated program. What is interesting is the type of statements which add the most time to the programs. BASIC is slowed down considerably by FOR...NEXT loops and array addressing while FORTRAN is not. However, both are slowed by floating point arithmetic. Floating point operations take sufficiently large amounts of number processing that it starts to take a significant fraction of the interpreting time in BASIC. Since both BASIC and FORTRAN perform floating point calculations the same way, it is not surprising that there is a smaller speed difference here.

Timing Comparisons

Benchmark	Fortran Integer	Fortran FP	Basic 4.0
1	.033 seconds		1.9 seconds
2	.057	2.9	7.5
3	2.0	9.0	20.6
4	2.0	10.6	20.9
5	2.0	10.7	22.1
6	2.1	10.8	36.9
7	2.2	11.0	58.5

The question that many people will have is how the times for FORTRAN on an 8080 compare with "real" computers. My laboratory has a DEC 11V03 system with 28K words of memory and a dual floppy disk system. The CPU is an LSI-11 16 bit processor with the clock turned up about 50%. This unit is also equipped with the KEV-11 extended arithmetic chip. While this is the smallest of the PDP-11 series, the speed of operation is not that much different than most of the smaller 11's. Anyway, benchmark #7 in the integer mode took .7 seconds, roughly a factor of three faster than the 8080. This is somewhat surprising after all the claims for the superior instruction set, extended arithmetic chip and 16 bit words. It may be more of a comment on the relative quality of the FORTRAN compilers. The speed difference is about the same for BASIC on the PDP11 and on the 8080.

Summary

After all these very nice features, what things are there to dislike? So far there are only a few. The first is a very minor point but also very frustrating until understood. The heading and any error messages are printed in both upper and lower case letters. Video terminals with upper case only get error messages which consist mostly of punctuation marks. These messages are not very useful. In software meant for general use, the programmers would do well to avoid being cute. The upper case is easier to read anyway. The cure for this was to add a routine to my I/O drivers in CP/M to convert lower case to upper case. This takes only a few bytes and is easy to implement.

The second criticism is more basic although it has nothing to do with the software. The price for the package is $500. Obviously, at that price, Microsoft does not intend the package for the individual hobbyist and is more interested in selling commercial licenses. Cromenco, in fact, sells this package for $95 *with their systems* under a license from Microsoft. At $100 or less, there is a tremendous market numbering in the hundreds of thousands over the next few years. At $500 very few will be sold. Indeed DEC wants $750 for their RT-11 FORTRAN which has considerably more development time behind it than FORTRAN 80, and which has a smaller market.

From a user point of view, one additional problem is the typically poor manual. The one included is over 100 pages but severely lacking in clarity. A particular problem in Microsoft manuals is that the table of contents has no page numbers and the index has numbers after the entries but they do not always correspond. The problem seems to stem from the fact that one manual is written, slightly modified and then padded with various errata and addenda. It should be mentioned at this point that DEC and IBM both have very nice manuals but they are in general even less readable than this one.

In summary then, this is a very good package which is convenient to use and runs fast. If it were priced at $100 everyone should go out and buy it. ■

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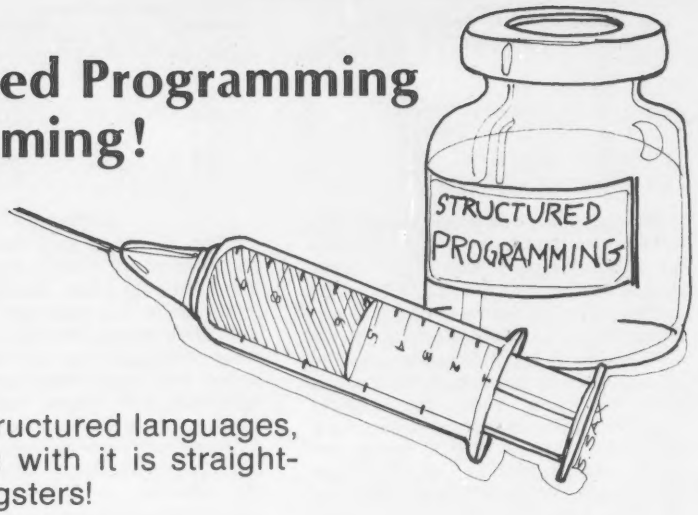

A look at one of the newest structured languages, tiny c, and how programming with it is straightforward enough even for youngsters!

Kids can learn structured programming. And they can learn it and use it well!

This is the story of my delightful experience teaching my sons Paul and Mark structured programming. Paul is eleven years old. His programs are quite advanced; he is heavily into moving graphics "shoot-'em up" games. Mark, age nine, is just beginning, but as we will see, he has mastered several fundamentals. Accompanying this article are two short articles by Paul and Mark, describing in their own words, their latest programs. I edited their articles only to the extent that their school teachers would have.

I have insisted from the start that they document their programs. In particular, they must put comments in their programs giving their name, date when finally debugged *and their age.* They also put in comments to help understand the code. It's only fitting they should write their own articles.

Let me begin at the beginning.

The Trip Home From Trenton

Two years ago, when he was 9, Paul first showed a knack for programming. We were coming home from the Trenton First Annual Computer Festival, and he was reading *101 BASIC GAMES.* This book has 202 pages. If you open it anywhere, the left side is a listing in BASIC of a game. The right side has sample runs, penciled in comments, relevant cartoons or other artwork, etc. Paul was reading BOXER at the top of his voice. Mark and Daniel added noise, laughter and loud game ideas of their own design. That drive home was an experience I will never forget.

Paul discovered that the sample runs didn't have all the dialog. There was more dialog in the PRINT statements in the program listing. He started reading these PRINT statements. Then he was reading other statements, too. He started asking questions like "Dad, what does FOR do?" With one eye on the road, and one on the book, I explained things as best I could while driving down Route 33 at 55 miles per hour. By the time we got home, Paul had read and understood a couple of programs.

As Paul learned more of BASIC, I became concerned over the limitations of the language, chiefly the non-mnemonic names. As his programs became larger the absence of functions and local variables were leading to bad programming habits. I found I was teaching various "bad habit" techniques to get around these limitations. I found Paul accepting these lessons, innocently, as true wisdom.

At the same time I was bringing a terminal home to do real work. I would dial up our company computer and do my programming using the C language. This language is designed for structured programming. It has all the good things described in this article. Paul would lean on my right shoulder so I could hardly type, munch a cookie in my ear, and watch. Then he'd ask, "What's the WHILE for, Dad?" Gradually he picked up C. Once when I explained a feature of C, he exclaimed, "Ohhh, that's better!" The comparison was to Basic, his native computer tongue at the time.

One night I came home from work and was met at the door by Paul, wide-eyed and turned on. "Look, Dad!" What he had done was to translate (on paper) his entire software repertoire into C. (At that time this was three programs, a guessing game and two nim-like games.)

So what could I do?

I developed an interpreter for a subset of C for our 8080 home computer. We call it tiny c. Paul has become quite competent in this language.

Now, two years later, Mark is 9. Mark never learned BASIC. His first (and only, so far) program was recently completed. It's in tiny c. He's learned the fundamentals of flow-of control, variables, variables having names, variables having values, variables having their values changed, printing and reading. Mark, too, has written an article describing his project.

Paul and Mark have had lots of guidance from me; but they each did this work themselves. My guidance amounted to coaching. I think I can fairly claim that structured programming is not just for sophisticated professionals. It is for the software beginner. It is for the hobbyist, because it leads to program clarity and more enjoyable programming.

What is tiny c?

Tiny c is modeled after C. I chose the

Tom A. Gibson, Tiny c Associates, PO Box 269, Holmdel, NJ 07733.

smallest subset that would still be useful for games, education, and just plain fun. It has only six statements. Four of them are:

INT and CHAR declare variables and one dimension arrays of type integer and character respectively.

WHILE (condition) statement is the looping statement. It performs its object statement repeatedly until the condition becomes false.

IF (condition) statement1
ELSE statement2 (The ELSE part is optional.)
IF performs statement1 if the condition is true, otherwise it skips statement1. If the condition is false and if there is an ELSE clause then statement2 is performed.

A compound statement is a group of statements enclosed in square brackets:

```
IF ( x  0 ) [
  x = x-1
  a = 2*a+b
  b = b-1
]
```

In this example, if x is positive the whole compound statement is done. Otherwise the whole compound statement is skipped. (This is the "Oh, that's better" feature.) The statements within a compound statement may themselves be IF's or WHILE's. Nesting is permitted in an arbitrary fashion. Now the fifth statement can be defined:

BREAK causes the innermost WHILE to exit and control flows to the statement after the WHILE.

That leaves one statement, RETURN, which brings us to the subject of functions.

Functions

A large software project can usually be broken into natural parts, and each part programmed and debugged as a separate unit. Each unit then becomes a reliable building block for the construction of still larger parts of the project. Sometimes units can be designed to be useful in many projects. In various programming languages these building blocks are called subprograms, subroutines, or simply functions. In tiny c they are called functions. Here is a tiny c function for any computer-versus-human game;

```
GAME [
  GETREADY
  WHILE ( STILLPLAYING() ) [
    HUMANTURN
    IF ( STILLPLAYING() ) COM-
      PUTERTURN
  ]
  GAMEOVER
]
```

The name of the function is GAME. The compound statement that follows is called the "body" of the function. GAME divides the design of the game program into five parts:

Stopwatch

This is a program that imitates a stopwatch. You can start the stopwatch, stop it, get the present number of seconds while it is running and end the program by typing certain letters on the keyboard.

Detailed description

After naming the variables, the instructions are printed on the screen. Then MAGIC is set to 31. MAGIC is a magic number that determines the accuracy of the stopwatch. It takes one second to go through the inner WHILE loop 31 times; so every 31 times through the loop, another second is counted. At the beginning of the outer WHILE loop, the computer comes to the statement:

K=GETCHAR

When the computer comes to a GETCHAR, it stops and waits until a character is typed. When a character is typed, it puts that character in K. The character will most likely be 'g' (to start the stopwatch) which will make the next IF statement true.

TIME is then set equal to zero. The next statement reads:

N=MAGIC/2

That will set MAGIC to 15 (tiny c doesn't have decimals). Then it will only have to go through the inner WHILE loop fifteen times before counting the first second. When a half-second has passed, the computer will count one second. The purpose of this is to round the actual time to the nearest second. If the actual time is between ½ and 1½ seconds, the computer will count one second. If the actual time is between 1½ and 2½ seconds, the computer will count it as two seconds.

In the beginning of the inner WHILE loop, N is set greater by one. Eventually, by going around in the WHILE loop, N will equal 31, so that the next IF statement will be true:

IF(N==MAGIC)

TIME, which was zero, is now set to one, as the time which was consumed by the WHILE loop and other parts of the program is one-half second. N (which is 31) is set back to one so it will count up one second.

Each time around the inner WHILE loop, the computer tests to see if you have typed an 's' or a 't' by using two CHRDY function calls. A CHRDY function call checks if you have typed any character. CHRDY is short for CHARACTER-READY. If the character that is ready (typed) is an 's', then the computer breaks out of the inner WHILE loop and comes to the statement:

IF(K=='s') [

That statement is false because K is still 'g', so it skips that and comes to the statement:

IF(K=='x') BREAK

That statement is false because K is still 'g', so the computer skips it and comes to the end of the outer WHILE loop. It goes back to the beginning of the WHILE and first comes to the statement:

K=GETCHAR

The computer gets the character 's', which was typed before, and puts it into K. Next it comes to the statement:

IF(K=='g')

This is false since K is now 's', so it skips that IF and comes to the statement:

IF(K=='s')[

This is true, so it does the commands listed between the brackets enclosing the IF statement which are to print the number of seconds on the screen.

After it finishes that it goes to the top of the outer WHILE loop and comes to the statement:

K=GETCHAR

The stopwatch has just finished one complete timing, from 'g' to 'stop.' Now it is ready to start up again.

There is one command I haven't explained yet. You can find out the number of seconds while the stopwatch is running by typing a 't.'

If the stopwatch is started up again by typing a 'g' the computer will come to the two CHRDY function calls. One of them checks if you have typed a 't.' If you have, then the computer does a GETCHAR and gets the character. Then it prints out the time; but after that the stopwatch continues counting.

If you want to stop the program, type 'x.' Eventually, the computer will come to the statement:

IF(K=='x') BREAK

This is true, so the computer will break out of the outer WHILE loop and come to the end of the program. ■

Paul Gibson - Age 11 Holmdel, N.J.

GETREADY — which initializes things, and prints instructions if requested.

STILLPLAYING — which determines if the game is still going, and returns TRUE if it is, and FLASE if it is over.

HUMANTURN — which conducts the human's turn.

COMPUTERTURN — which conducts the computer's turn.

GAMEOVER — which computes and prints scores, makes remarks about the human's skill, promotes the human, or whatever.

The GAME function is the first step in a divide-and-conquer strategy of program development. Let's carry this one step further. The GETREADY function can be expanded this way:

```
GETREADY [
   PL "Do you want instructions?"
   IF ( GC()= ='y') INSTRUCTIONS
   SETUPBOARD
]
```

GETREADY divides the initialization job into two parts: INSTRUCTIONS, and SETUPBOARD. (Note: GC() =='y' reads a character from the keyboard and tests if it is a y.) Notice that both GAME and GETREADY are universal. They can be used in many game programs. Programming in this fashion eventually leads to a library of useful, general purpose functions. These can be pulled off the shefl into a software project. You know they work because they were used before. Your programming becomes more productive, and more pleasant.

The next time you're programming a sizable project (anything more than a page) try to identify subsets of the logic usable in other projects. Capture these as functions. There is a gratifying feeling in discovering a general purpose function where none was suspected.

Now the sixth statement can be defined:

RETURN causes a return from the current function and assigns a value to the function.

Input/Output

Does anything seem missing? Where's the input/output? This is done through functions. For example:

```
PL "Tiny c is neat!!!"
```

will Print on a new Line the character string shown. The quotes are not printed. PL is a function with one argument, a character string. There are other functions to print a string on the same line, read a string, read and print numbers, manipulate strings, do file input/output; altogether twenty five "standards" functions.

Now back to the main subject.

Teaching approach

First, not all kids want to learn programming, or are ready for it. Daniel, my oldest, has found other creative outlets, and programming looks like a lot of work to him. You can usually coerce your children into doing their homework for school, but not into debugging a program they didn't want to write in the first place. Wait until your student is ready and eager.

Second, take small, carefully planned steps. There are lots of concepts to be mastered. For example, the idea that programming a computer is teaching it to do something which it will *later* do on your command; this is a subtle idea. It must be understood or future lessons won't "take." Flow of control is easy, but must also be understood.

Another important point is to give the student early and frequent reinforcement. This means teach only a small amount, then give an exercise that gives them an experience based on that lesson. To do this a carefully planned set of exercises are needed. Each must take a small new step. Each must carefully avoid entanglements in issues not yet taught.

My first lesson covers:

- A program has a name
- A program has a body enclosed in brackets
- Inside the body are instructions for the computer to follow
- How to print something using PL

Sit down with the student, and write the following short program. Use the student's name where I used Mark's. Explain the reason for each line as you write it: HINAME

```
[
   PL "Hi, my name is MARK."
   PL "I speak tiny c!"
]
```

Do this on paper. That puts a focus on the programming aspect of the lesson. Terminals and editors are more complicated than we like to think they are. Doing the above lesson on-line will entangle you in issues not yet taught.

Now assign the first exercise. It's structurally identical to HINAME, but will be the student's own work:

> Write a program called FOOD. It will print three sentences, each on a separate line. The sentences are:
>
> Hi, my name is (student's name).
>
> I like spinach.
>
> I like cooked carrots, too.

Have your student do the exercise on paper, not on the terminal. Otherwise, the complications of the editor come into play. Work with the student until the exercise is correctly done on paper.

Now you can turn to the terminal. Show how to enter the program, correct typing errors, proofread the

My First Tiny c Program

I've made my first tiny c program. My father told me what everything meant. I'll explain what everything in the program means. Its name is NAME. Here is the program.

```
/*My first tiny c program, by Mark Gibson
/*December 3, 1977
/*Age 9
name
[
char guess (70)
ps "what is my name?"
gs guess
if (ceqn(guess "tiny c", 6))
pl "RIGHT!!!!!!!!!!"
else
pl "WRONG!!!!!!!!!!"
]
```

The first and second lines mean that it is my first tiny c program, I wrote it, and when I wrote it. The third line tells my age. The fourth line tells the name of the program. The fifth line means this is where the program starts. The sixth line means it makes GUESS a variable. It's like an egg carton except it doesn't hold 12 eggs; it holds 70 characters.

The seventh line means to print a string and say "what is my name?" The eighth line means: stop the program and wait till you type the name and hit return. It puts it into GUESS. The ninth line tests if what you typed is equal to "tiny-c." If it's equal CEQN is 1; if anything else, then it's 0. The tenth line means to print a line saying "RIGHT !!!!!!!!!!". It's done by the IF only if CEQN is 1. The eleventh line means if the CEQN equals 0 then go to the next line. The twelfth line means to print a line saying "WRONG!!!!!!!!!!" only if CEQN equals 0. The thirteenth line means the end of the program. ■

Mark Gibson - Age 9 Holmdel, N.J.

program for correctness, and finally, how to run it. Show how to save it. Go through all this in small steps. Be patient with a young student's lacking of typing skills. Don't type it for him. He's got to learn the keyboard, too.

Then I move to the IF statement. Again, write a sample program demonstrating the IF in its simplest form. The exercise I gave is "What's my name." See Mark's article for this. Note it does not loop; we're not ready for this yet.

The next step is the WHILE statement. The simplest, and for kids a delightful form of the WHILE is the infinite (do forever) form. This program illustrates the idea.

```
FOREVER
[
  WHILE (1)[
    PL "My name is MARK...."
  ]
]
```

The "1" is always true. So this program looks forever, i.e. until interrupted.

This sets the stage for teaching BREAK. I have found that young students can learn:

```
WHILE ( 1 ) [
  •
  •
  •
  IF (condition) BREAK
]
```

a lot easier than the more sophisticated:

```
WHILE (condition) [
  •
  •
  •
]
```

These two constructs do different things, of course. The first does the loop once or more until the condition becomes true. Then it leaves the loop. The latter does the loop zero or more times until the condition becomes false. The former model seems to fit young student's projects more often than the latter.

Then put the IF and WHILE together with this exercise:

> Write a program that reads a number. If it is negative the program prints, "That's negative, I'll stop now." and the program stops. If it is zero or one or two or three it prints, "That's a zero" (or "one" or "two" or "three"). Then it repeats the whole process. If the number is bigger than three, it prints "That's a BIG number" and repeats the whole process.

This should be enough examples to illustrate the teaching approach. I don't have a complete lesson plan. A lot is done by seat-of-the-pants judgment. Go with your student's interests. Paul is hot on graphics, as his article shows, so of course I invented lessons and exercises to get him there.

Here are a few other pointers. Read programs with your student. Discuss good and bad points of style.

Variables deserve a special attention. In tiny c you "make" a variable with the INT or CHAR statement. It is important to distinguish the concepts of a variable from the value it contains. I explain that a variable is a *box* with a *name* and *type* on its side:

> "In the real world there are lots of types of boxes: shoe boxes, refrigerator boxes, computer boxes, etc; but tiny c has only two types of boxes: INT and CHAR. You can have as many of each type as you want. Just be sure each box has a different name on the side. Inside each box you can put one value. A CHAR box holds one character, and INT holds one integer....."

The above is more or less a direct quote of a lesson I've given many times. Incidentally, an array is an egg carton!

I hope I have dispelled any notion that structured programming is sophisticated and reserved for the elite. It is not. For new programmers, well guided, it is as easy to learn as any other higher level programming technique (i.e., very easy). For old programmers it will be a bit more difficult. You must unlearn old habits, and that's always hard. But I did it after 15 years of FORTRAN! Paul converted, although much less painfully than myself. Kids drink new languages like water!

Warning: You won't learn structured programming by sitting down with an old BASIC program and a tiny c manual. Paul still gets all hung up converting his old BASIC programs to tiny c. It's hard to structure old unstructured programs.

Learn this new skill from the ground up. Use it on *new* programs. At the end of the road is a new skill, a new enjoyment of the programming process, and the ability to teach it to your kids. Remember, you've got to plan all those small steps. ■

> Would you like to know more about tiny c? It's available in both 8080 and PDP-11 versions from:
> Tiny c Associates
> Box 269
> Holmdel, N.J. 07733

References

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3. Salisbury, Alan, "Structured Software for Personal Computing," *Creative Computing*, Mar/Apr '78.

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K-STATE IS A GIANT IN MINICOMPUTERS

Cheryl May

Programmers at work in the KSU Computer Lab

At work on an Interdata

The departmental computers

The KSU Computer Science Department's modern facilities are housed in Fairchild Hall.

In 1863, Kansas State University was founded as the nation's first land-grant college. Today, it is first in the nation in the field of minicomputers. Although the school's major emphasis remains agricultural, products of the modern age have been given due respect, so much so that KSU has become a giant in its minicomputer specialty.

The 315-acre campus has an additional 5,000 acres around the state which are used for experimental agriculture. It is a study in contrasts that the huge ag-oriented campus would be such a leader in computer research.

KSU has an enrollment of more than 16,000 students, with a miniscule 215 of those people enrolled as computer-science majors. Forty-five of that total are graduate students who are an intrinsic part of the school's research programs. Because they are so few, students are given a great deal of attention. Statistics citing the school's estimated uses of computer time are a bit misleading. Citing two-thirds of computer time devoted to research and one-third devoted to teaching, one might think that the students were slighted. On the contrary, students have an opportunity to participate in, and make valuable contributions to, the on-going research projects at the school.

The college's major system is an IBM 360/145, used for the university's administrative functions, record keeping, and language instruction.

The real "stars" of the KSU computer science department, however, are the minicomputers. Said by many to be the finest minicomputer laboratory in the country, the department not only agrees, but continually proves that theory with its outstanding research projects.

"We are experts in minicomputers," says K-State computer science department head Dr. Paul Fisher, adding, "Our facilities are the finest in the country."

Fisher's minis are tied together in a research network of four main computers and two microcomputers. The computers include an Interdata 832 with 750,000K of storage, four discs and two tape drives; an Interdata 732 with 650,000K, two disc units and a tape drive; and an Interdata 85; and an Interdata 7/16. The microcomputers are Interdata 6/16's used for networking projects.

Soon the facilities will be strengthened by the addition of a PDP 11/34, a minicomputer likened by Prof. Ed Basham of the department to the school's current Interdata 6/16.

The university is purchasing $330,000 worth of new equipment to aid them in their latest project for the U.S. Air Force. Funding for the purchase comes from a half-million dollar grant from the Air Force School of Aerospace Medicine at Brooks Air Force Base in San Antonio, Texas. Basham said that $100,000 of the new equipment will be installed at K-State and the remainder of the machinery will go to San Antonio. The Air Force project entails research which will make it possible for the Air Force to transfer information among its two large-scale and its 21 minicomputers of different manufacture.

"The software for 'networking'—the easy exchange of data among computers—just does not exist at the

present time," Fisher commented.

"The Air Force is funding this research with $500,000 for the first year and we anticipate they will continue funding at about the same level for the next three years. That's how long it will take to complete the project," he added.

Fisher noted that the Air Force grant is the largest ever awarded to his department for a project.

The Air Force project came about as a result of the reputation KSU earned for itself while developing a similar prototype network project for the U.S. Army during the past two years.

"The Air Force wants us to provide a similar network in their environment," Fisher said. "They also want us to develop programs and procedures so that it would be easy for someone at any of the computer locations to utilize data from a common source."

Essentially KSU does this with their own facilities, providing three outlets which computer-science students can use in various locations on the campus to hook in to information in the university's main computer.

One of the main reasons why KSU can provide such excellent facilities for its students and maintain such a high quality reputation among university computer science experts is the funding provided by contracts with the armed services and private industry. NCR and Interdata Corp. are among clients.

"Over the past three years the amount of funding in the department of computer science has been doubling each year," Fisher said. "This year we will probably exceed $1 million in outside funding. These grants provide support for students, faculty, travel, and other things necessary for a strong program."

Part of the travel done by KSU computer experts is by automobile to the neighboring University of Kansas at Lawrence, some 90 miles down Interstate 70. In a cooperative educational program, professors from each school travel back and forth each semester, teaching and doing advisory work on special projects. KSU has specialists in applied minicomputer networking, and supplements its expertise with the KU profs who are more knowledgeable in the theory of computer science.

In additional education projects, the department conducts demonstrations for the U.S. Army Computer Base Command located at Ft. Riley, Kansas, which is adjacent to K-State's Manhattan campus locale.

The University's computing center is the site for on-campus educational efforts. It is the production-oriented area of the computer department at KSU. Working in conjunction with other computer department areas, students take their computer time in the center, located in the basement of Fairchild Hall. A graduate student is on hand during operating hours to answer questions and serve as a troubleshooter for any programming problems. In addition, for student convenience, satellite terminals are located in several other spots on campus.

Students also have access to a new microcomputer network set up for desk top use. The units are KIM-1 tabletop computers, and are about the size of a desk-top calculator. In addition, students have built several microcomputers from kits and are in the process of building more.

The department built a special KSU-Bus; that is, they developed and built the prototype for linking two computers together for the network they developed for the Army. To celebrate their ingenuity, graduate students bought a toy school bus and glued a kazoo to its roof—the KSU-Bus.

The department's collective ingenuity and ability, along with the top equipment in the field, has enabled it to develop an outstanding reputation in its minicomputer specialty. Through seminars, meetings of computer science groups and achievements of various faculty members, KSU is making a solid reputation for itself in the computer world. ■

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BILF: BASIC Infinite Loop Finder

An objective review of one of the most useful software packages on the market!

Jeff Levinsky

This article is intended to warn those who have contemplated purchasing the BILF (BASIC Infinite Loop Finder) program offered for BASIC users by the Cosmic Software Corporation in last month's issue of *Popular Megabyte*. BILF, as I have painfully discovered, and its soon-to-be-released big brother (known as Super BILF), are little more than impressive hoaxes: the infinite loop finders must and do fail.

Actually, the idea behind BILF is a good one. Infinite loops, as we all know, are sections of code that are inescapable once entered (a software analogy of a black hole). The simplest possible infinite loop in BASIC is:

```
10 GO TO 10
```

which is of course inescapable. However, large BASIC programs may contain far more insidious infinite loops which are almost impossible to detect. BILF claims to be able to detect any infinite loop no matter how concealed.

My own motivation for purchasing BILF was to check some large puzzle solving programs that I have written. These puzzle programs examine all possibilities at each stage in the solution of the puzzle and are inherently very slow. To solve the puzzles for larger and larger boards, the time required becomes much greater. For example, my 8080-based computer requires only 30 seconds to produce a winning strategy for one puzzle on a three by three board. However, I have calculated that as much as 27 hours would be needed to solve the very same puzzle for a four by four board. But what if I did not know how long the computer would take to solve the puzzle and the program contained an infinite loop? I would run the program, see no results, but then assume that perhaps in another moment the program would halt, wait out that moment, make the same assumption, wait out another moment, etc., etc. I would never be sure whether or not the program had failed. With BILF, I can obviously analyze my puzzle solvers and then be confident that they will not infinite loop but instead will eventually halt.

Now for the actual details on BILF. Cosmic Software charges 20 dollars for it (Super BILF will cost 30 dollars) and supplies it on a standard cassette which loaded easily into my machine. BILF is written in standard BASIC and consists of 260 lines of the most obscure code imaginable. Once loaded, BILF is set to contain the address of the program to be tested *and* the address of the data that the (test) program is to be run with. Both the test program and the test data must be in memory. The reason that BILF requires the latter is that a program may infinite loop only upon certain input. The program below will infinite loop if, and only

```
10 INPUT I
20 IF I=0 THEN 20
30 PRINT "MADE IT!"
40 STOP
```

if, the inputted number is a zero. So, in order for BILF to decide whether or not this program will infinite loop, BILF must know what number will be inputted, that is, the data. Figure 1 gives a pictorial summary of this.

I first used BILF to test some very simple programs, such as the one above. In all cases, BILF worked admirably: it quickly and consistently produced the correct answer. I then tested my puzzle games. As a testament to my computer skills, BILF found all of my programs to be free of infinite loops. In short order, I had tested all the programs that I had, save BILF itself. Testing BILF on itself presented something of a challenge, but I was curious to know if BILF might somehow infinite loop, thereby failing to decide whether or not its test program would infinite loop. Although this possibility sounds bizzare, it was easy to try: I set the address of the test program for BILF to be that of BILF itself. The address for the test data did not matter in this instance because BILF does not contain any input statements. Using the same sort of notation as above, I ran:

Figure 1

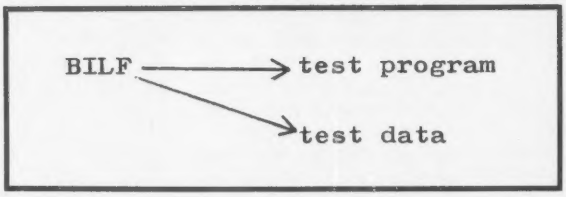
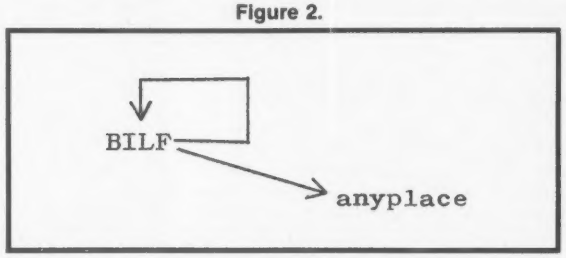


Figure 2.



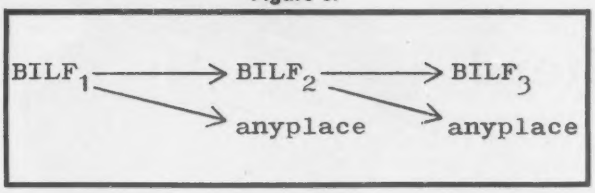
As the arrow shows, the program that BILF tested was BILF itself.

There a few tricky points here. Note that in this test of BILF, the BILF being checked for infinite loops is itself checking BILF for infinite loops. This is due to the fact that both the BILF that I am running (which I will call $BILF_1$) and the BILF that it is testing (which I will call $BILF_2$) are one and the same, and therefore share the address of the test program. So when $BILF_1$ tests $BILF_2$ $BILF_2$ tests BILF also. I shall call this third instance $BILF_3$. In the same notation as before, we have:
This is equivalent to Figure 2. I suspect that some people will insist here that $BILF_3$ must be testing a $BILF_4$ which is, in turn, testing a $BILF_5$, and so on. Whether or not this is true is immaterial. The important observation is that $BILF_1$ is testing $BILF_2$ testing $BILF_3$.

Upon running the above test, I discovered, as might be expected, that $BILF_2$ testing $BILF_3$ does not infinite loop.

Jeff Levinsky, 1697 Calle Leticia, La Jolla, CA 92037.

Figure 3.



Since all three BILFs are actually the same here, I can state that BILF testing BILF does not infinite loop. Of course, if $BILF_2$ testing $BILF_3$ *did* go into an infinite loop, so would $BILF_1$ testing $BILF_2$: my experiment would never have halted.

The next step in my study of BILF was to modify it in a very simple but devious way. The very last lines of BILF are:

```
9800 PRINT "THIS PROGRAM WILL INFINITE LOOP"
9810 STOP
9900 PRINT "THIS PROGRAM WILL NOT INFINITE
     LOOP"
9910 STOP
```

Apparently, once BILF determines that the test program will infinite loop on the given input, it will go to line 9800 to print the message there. Then BILF will stop. On the other hand, if BILF decides that the program will not infinite loop, it will go to line 9900, print the message there, and then stop. Since BILF always prints one of these two messages, I assume that BILF always ends by going to either line 9800 or line 9900. My modification to BILF was to change line 9910 into an infinite loop. This results in:

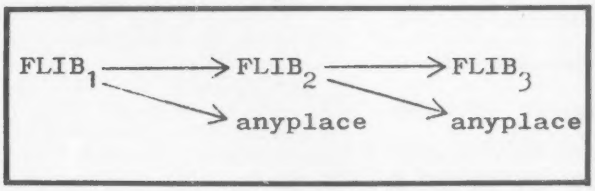
```
9800 PRINT "THIS PROGRAM WILL INFINITE LOOP"
9810 STOP
9900 PRINT "THIS PROGRAM WILL NOT INFINITE
     LOOP"
9910 GO TO 9910
```

I call this new version FLIB. With the modification, FLIB works exactly as BILF does, until after the final message is printed. Then, if the test program does not contain an infinite loop, FLIB *will* loop forever. If, however, the test program does contain an infinite loop, then FLIB will stop (and thus will *not* have an infinite loop). Only these two cases are possible, and consequently the following rules applies:

"FLIB will infinite loop if, and only if, the program it tests will not."

No doubt one question is now obvious: what happens when FLIB tests itself? This is done just as for BILF and is illustrated in Figure 4. Before indicating the actual results of running this

Figure 4.



test, I will first explain the expected outcome. Applying the rule given above for FLIB, we have:

"$FLIB_1$ will infinite loop if, and only if, the program it tests will not."

The test program is $FLIB_2$, and it is testing $FLIB_3$, so we have:

"$FLIB_1$ will infinite loop if, and only if, $FLIB_2$ testing $FLIB_3$ will not."

But all three FLIBs are actually the same, so we have:

"FLIB will infinite loop if, and only if, FLIB testing FLIB will not."

This is a paradox! To see why, consider each possibility. If $FLIB_2$ decides that $FLIB_3$ will infinite loop, then $FLIB_2$ will stop, and thus $FLIB_1$ will infinite loop. In other words, if FLIB testing FLIB stops, then FLIB testing FLIB will not. This is clearly impossible. But so is the alternative: if FLIB testing FLIB does not stop, then FLIB testing FLIB will. Thus, we have the paradox.

Since most people agree that paradoxical behaviour does not occur, FLIB cannot actually follow the rule given for it. That rule was obtained by just a simple change in BILF, and therefore BILF also cannot work as claimed. This logic leads me to believe that Cosmic Software has perpetrated an impressive but indisputable hoax. Furthermore, their Super BILF must contain the same sort of ending lines of code and thus once could then construct a Super FLIB to which the very same paradox would apply. In fact, *any* infinite loop finder cannot exist, for this very reason.

Upon realizing all of this, I wrote an irate letter to Cosmic Software, explaining in detail the arguments above and demanding a refund. As of this month, I have received only a polite reply from them stating that they are investigating the matter and have planned a new release that will fix this "bug." In my opinion, they have totally missed the point (perhaps intentionally??) for the problem is insurmountable. I can only warn others to avoid Cosmic Software, and any other firm that makes such claims.

I have left one question unanswered. What indeed does happen when FLIB tests itself. As a matter of sheer curiosity, I have set the program running and, as of this writing, it has yet to halt. And as I see it this is exactly right. ■

Note: Although contrived, this article illustrates a valid paradox in computer science. The actual problem is typically known as the Halting Problem and was developed by Alan J. Turing, although it appears under many other names in other fields as well.

References:

Minsky, Marvin L. *Computation: Finite and Infinite Machines.* Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967.

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Down With Typewriters!

Ralph Roberts

Word processing is one of the most popular applications for business and home computers! Smoke Signal Broadcasting has a new system for you to consider.

The reasons I have for being in personal computing have usually been unsatisfactory when trying to explain to friends why all these little black boxes are around. In my case the little black boxes are a literal description since I run a SWPTC MP6800 computer, AC-30 cassette interface, Smoke Signal BFD-68 dual floppy, and have two small black cassette players. My Micro-Term ACT IV terminal is also trimmed by black sides. When I confess that the only reason for spending all this money is that I simply like computers and enjoy fooling around with them, many people laugh. Most of my friends think this absurd and leave to work on their bass boat or build bookcases and birdhouses in their basement or something equally useful.

Well, that idea was no good so I started showing off all the game programs I had. I sat the visitor down in front of the computer and let him play Lunar Lander, Hamurabi, and my personal favorite written by me, Star Pirate. They enjoyed that and it took quite awhile to get rid of some of them. I still have people coming back to play Star Pirate and trying to amass their fortune in interstellar credits. To keep the computer from being tied up so much, I kept rewriting the game to make it harder, so difficult that my friends would be discouraged from playing it. Unfortunately they get better with practice and I keep getting captured by the pirates and sold into slavery. The game is now 15K long and extremely elaborate. Everybody enjoys it but they don't consider the game as a valid reason to own a computer. You can play games almost as good down at any penny arcade for just a quarter.

Ralph Roberts, P.O. Box 8508, Asheville, NC 28804.

I, like many of the readers of *Creative Computing*,, was for years a frustrated writer.

Being a small businessman (we have two stereo shops here in western North Carolina) I came up with the idea of using the computer in our normal business operations. We now do daily bank deposit ledgers, check disbursements, billing and inventory control on my personal machine. I keep the computer, my marvelous little 6800 powerhouse, in the office anyway since I seem to spend most of my time here. So, I show off the computer doing actual legitimate time-saving work in our daily operations and my friends say, "Hey, that's great, but I don't have a business and I couldn't really justify owning one. It sure is nice though."

I grit my teeth and explain how they could keep their personal records, their wife's recipes, play games (both educational and entertaining), run a security system, and all the other reasons you see in magazines such as Creative Computing. So they ask me if I do all those things. Why no, I use the machine in my business. "Aha!", they exclaim and it's back to the bass boats, basements and birdhouses.

I kept searching for that perfect reason, the justification that would capture the imagination and cause the person hearing it to not only understand why he should have a computer but to rush out and get one. Then I bought some new software from Smoke Signal Broadcasting and a blinding light dawned, it thundered loudly, and the ANSWER, fully developed, popped into my head. The perfect solution, something many people want to do. I speak of writing, of processing words, of creating literary masterpieces. I, like many of the readers of *Creative Computing*, was for years a frustrated writer. Now the

computer could help me write, prepare manuscripts, submit them, and with luck, sell my writings. Sell, that's the key word, because it means a check for your writing and money in the bank for more bass boats, mistresses or a new high speed printer for the trusty old microprocessor.

First of all, why have we been frustrated from selling our colorful and enthralling short stories, our action filled novels, our marvelously complete and understandable technical articles? Simple, the worldwide conspiracy of typewriters against aspiring authors! I could always write. I could always come up with interesting story ideas. Taking a pencil, I have always been able to sit down and jot words on paper profusely. No problem, pencils like me, they thoughtfully provide erasers in case I make a mistake. But, you cannot send a smeared, pencil scribed story to an editor and expect him to do anything other than a rimshot into the old round file. The thing must be typed and that's the rub, typewriters have it in for us poor wordsmiths.

Typewriters are vicious things, they deliberately misspell words, they space wrong, they go to great lengths to make you type whole pages over and over and over. Deep within their twisted little mechanical hearts, typewriters hate and despise writers, they sit on dusty shelves in office machine stores devising scheme after scheme to make me or any other young, budding Hemingway look foolish. For years, they kept me from being published, the hassle and work of preparing manuscripts just flat took all the fun out of writing.

There are two pieces of software that I purchased from Smoke Signal and use in the writing and preparation of manuscripts for submission. The first is the SE-1 text editor, the second is the TP-1 text processor. Both came on floppy disc for my BFD-68 floppy and both have very excellent documentation. With these programs, my computer became a very powerful word processor. With these tools, I don't have to worry about making mistakes, I can pound out my stories in a fine creative fervor showing a kingly disregard for spelling and punctuation. If I make an error, it's simplicity itself to go back and change it. If I fail to explain why the hero in one of my science fiction stories conveniently comes up with a laser pistol, I can add that paragraph later. By use of these two programs, I can completely defeat the aforementioned diabolical conspiracy of vindictive, tin-hearted typewriters and see my words in print.

There are basically two steps, using my computer system, in writing. The first, the actual writing process itself, makes use of the text editor program. The Smoke Signal Broadcasting SE-1 Editor is similar to software available for those of you unlucky enough to have a Z-80, 8080 or 6502 based machine. By use of the editor, a file can be created and manipulated as much as you wish. In writing this article, for example, I made several errors in spelling (yeah, I'm not perfect, it only looks that way). The text editor allows you to make global changes. Let's say I've used the word 'computer' twenty times in this article and misspelled it each time. Rather than going through and changing each mistake, I merely enter the command 'C/computor/computer/200' and the editor will search through and correct the spelling each time I used the word and print only the corrected lines. The '200' tells it to search 200 lines.

The text editing system makes it easy to write, rewrite, proofread and correct your material — all without putting a single thing down on paper. You save the edited file on tape or disc as in my case. You can go back and work on the piece anytime (even after you have submitted the article). Should a magazine editor ask for a rewrite, you just call up that particular file and modify as needed. Without getting much more into the text editor, I'm in the process of writing a user's report on this version anyway, we can sum up by stating that you become the master of the flow of words by using the computer in this manner. It's a great advance and allows any writer to turn out a much larger quantity of work and breaks the psychological barrier some of us have always had against rewriting because it's so easy to go back and polish your work.

Typewriters are vicious things, they deliberately misspell words, they space wrong, they go to great lengths to make you type whole pages over and over and over.

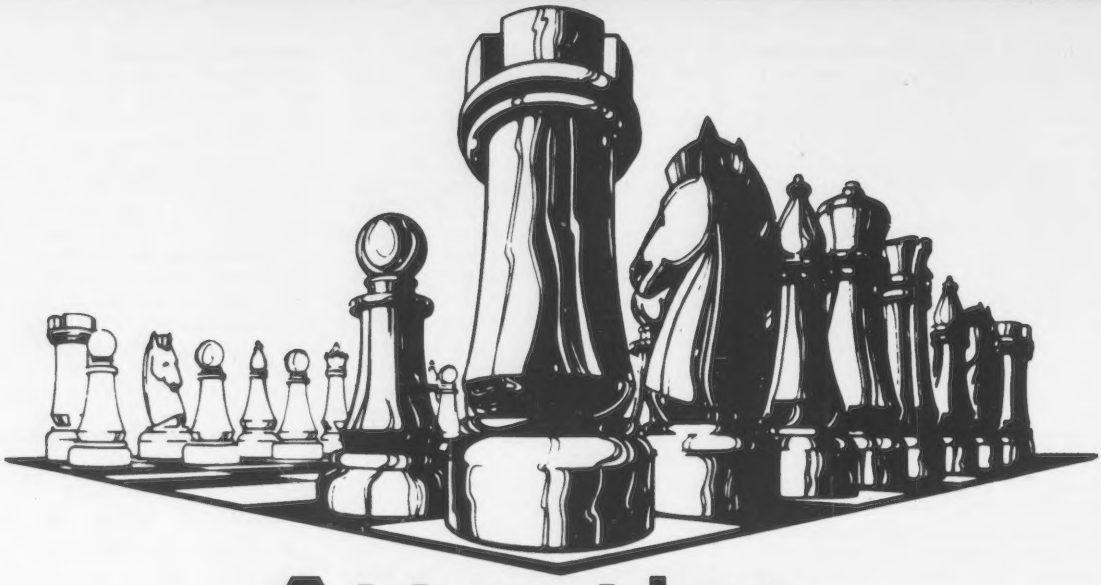
Now we have this article written and polished and corrected and rewritten and repolished and recorrected. Here comes the "hard" part, it's got to be put on paper neatly and in a professional format for submission to *Creative Computing*. (If *Creative Computing* doesn't buy this article, it's easy to use the editor program and put in the name of another magazine. Heh, Heh!). Actually, this turns out to be the easiest step of all. I merely call up the Smoke Signal TP-1 text processor and it prints merrily away on my Decwriter, formatting neatly with the correct number of lines per page and spacing so that both margins are perfectly even (right and left justification). The text processor also puts my name at the top of each page, the title of the piece and numbers the pages in order. All this, in case the pages get scattered at the magazine and need to be reassembled. I go have a cold soda pop or whatever while the computer does all the typing at 360 words per minute. Should a mistake have slipped by me in my earlier proofreading, it's extremely simple to correct that error and print that one page over.

The text editing system makes it easy to write, rewrite, proofread and correct your material — all without putting a single thing down on paper.

Using the text editing program I can control what I write and with the text processor I control formatting and manuscript preparation. It makes putting words together an immense amount of fun. It makes you, the person, more powerful and able to leap taller stacks of printed pages by using the computer as a tool to increase the amount of work you can do. The purpose of this article has not been to explain the inner workings of the Smoke Signal SE-1 Editor and TP-1 Text Processor but to put across to you the new justification I have discovered for owning my very own computer and to show how easy you can use the word processing power of a personal computer to achieve goals that might be impossible otherwise.

Does this really work? Can you actually write and sell your work using a computer? Yes indeed, these words printed here in *Creative Computing* attest to that and, as for me, watch for my by-line in other magazines, I have a hungry computer to support and we need the money. Also, when my friends ask me why all the computer stuff, I now just pull out some of my published work and say, "Here's one reason." So, the heck with bass boats and birdhouses — give me my personal computer and a mistress, and I'll write the Great American Novel. ■

These two programs are available on diskette from Smoke Signal Broadcasting, 6304 Yucca, Hollywood, CA 90028. SE-1 Editor - $29; TP-1 Text processor - $39.95.



Attention, Chess Phreaks!

Microchess for the TRS-80 is here! And only requires 4K of memory!

Les Palenik

MICROCHESS is written in Z-80 machine language and it fits in 4K of memory, so you can run it on the smallest TRS-80 system. It can be loaded into the TRS-80 computer using the standard CLOAD.

It is advisable to clear the screen before typing CLOAD. The loading of the program takes a little bit longer than one would expect after loading standard programs written in BASIC.

Since this program is written in machine language it will automatically start executing after successfully loading.

First, all available options and instructions will be displayed on the screen. Take a good look at this display, or even better, copy it on a piece of paper, because once you press "ENTER," you won't see it again.

After you press "RETURN" a graphic depiction of the chessboard will appear on the left side of the screen (approximately 2/3 of the screen is used for the chessboard).

The right hand side of the screen is used for communication between the player and the computer. All the messages and prompts will be printed on this part of the screen.

Les Palenik, 25 Silversprings Blvd., Suite 512, Scarborough, ONT M1V1M9, Canada.

The player can select the color, but not the side of the board. The computer's pieces will be displayed always at the top and the player's pieces at the bottom of the screen.

There are three different levels of play, ranging from beginner to an expert. You can decide on the level of play by typing:lQ=1,2, or 3. Usually one would select level 1 or 2, since the program responds quite quickly playing at this level. Level 3 is the best level of play, but is considerably slower and some players may lose their patience playing at this level. You can switch the levels of play anytime between the computer's moves.

There is a very interesting feature in this program which will allow the player to reverse the sides. It is the exchange command and you can execute it by typing an "X." Both sides will be reversed in a fraction of a second and you can use it to let the computer play a move again itself. Well, I admit it's cheating, but it can be quite interesting to see how the computer analyzes the opponent's side, and it can be used for simulation and learning how to play a better game of chess. In another extreme, one could play a game against himself by using the same command.

Once the program has been loaded, it will disable the break key, so if you want to break, the only way is to switch off the machine. Of course, then you'll lose the program and you have to load it again. This seems to be a rather clever protection of the program.

The program consists of the chess-playing logic and the graphic driver which displays the chessboard. The graphic driver is somewhat limited by TRS-80 video-display and its resolution (48x128 addressable locations), but all pieces on the screen can still be easily recognized.

The moves (especially the computer's) are done in a very neat way. When it is time for the computer to make a move, the cursor is moving on the screen, to indicate that the computer is still "thinking." Once the computer decides on its move, the particular piece will be flashed several times to draw the attention of the player and then it will be moved to its new location.

In summary, I think this is a very interesting program which will bring you many hours of enjoyment and, at the same time, improve your chess game. It demonstrates in a nice way the capabilities of TRS-80 and all in all, is an excellent program to have in your library. I would highly recommend it to you. ■

TRS-80 PET APPLE

MICROCHESS is the culmination of two years of chessplaying program development by **Peter Jennings**, author of the famous 1K byte chess program for the KIM-1. MICROCHESS 2.0 for 8K PETs and 16K APPLEs, in 6502 machine language, offers 8 levels of play to suit everyone from the beginner learning chess to the serious player. It examines positions as many as 6 moves ahead, and includes a chess clock for tournament play. MICROCHESS 1.5 for 4K TRS-80s, in Z-80 machine language, offers 3 levels of play (both Level I and Level II versions are included and can be loaded on any TRS-80 without TBUG). MICROCHESS checks every move for legality and displays the current position on a graphic chessboard. You can play White or Black, set up and play from special board positions, or even watch the computer play against itself! Available now at a special introductory price of only **$19.95**

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How to Hide Your Basic Program

John M. Nevison

The heyday of the secretive programmer is over. Today he* is forced to fight a rearguard action. The machine language of the fifties gave way to Fortran. In the sixties, Fortran gave way to Basic and Cobol. The seventies has seen contorted code yielding to structured programming. Professional practices have made life harder and harder for the secretive programmer. No wonder he hurries home from the office each night to the limited memory and cramped code of the personal computer. Here, in private, he can continue polishing his ability to obscure code from the prying eye of the reader.

But even here the future threatens. A Basic program can be well-styled on minicomputers, and books have appeared that show how micro Basics can be styled to reveal the program's ideas to the reader. New disc-resident Basics are widening the opportunity to style Basic on micros. Memory that is presently quite expensive will become quite cheap. One authority predicts that "a megabit storage chip will cost approximately $30 by 1985." Soon, perhaps within the year, bubble memory will make the secretive programmer's favorite excuse, limited memory, a thing of the past.

Now anyone can mystify the reader with inscrutable code by following these four simple rules of style.

In addition to losing his technological excuses for writing hard to read code, the secretive programmer will be besieged with readers who, from time to time, will chance upon a well-styled program, read it, and demand that *all* programs be well-styled and easy to read. The inscrutable program may be doomed! In order to survive today's threats to his art, the secretive programmer must set some rules of style.

1. *Confuse Naked Code with a Well-Dressed Program*

Always call small fragments of working code "programs" and the reader won't know what he's missing. If he gets the idea that a program should be easy to read and understand, the program's mystery is seriously threatened. Do everything possible to suppress the notion that a finished program should, like an essay, have a title, a date, an author's name, and an opening statement of purpose.

Example Before

```
100 REM    SORT              16 SEPTEMBER 1977   JOHN M. NEVISON
110
120 REM    SORTS A MIXED BATCH OF NUMBERS, B(), INTO ASCENDING
130 REM    ORDER.  ESPECIALLY GOOD FOR BATCHES OF LESS THAN 50.
140
142 REM    REFERENCE:  JOHN M. NEVISON, "THE LITTLE BOOK OF BASIC
144 REM                STYLE:  HOW TO WRITE A PROGRAM YOU CAN READ,"
146 REM                READING, MASS:  ADDISON-WESLEY PUBLISHING
147 REM                COMPANY, 1978.
148
150 REM    VARIABLES:
160 REM        B()...THE BATCH OF NUMBERS
170 REM        I.....THE INDEX VARIABLE
180 REM        L.....THE LENGTH OF THE CURRENT LIST
190 REM        X.....THE EXCHANGE VARIABLE
200
210 REM    CONSTANT:
220     LET N9 = 38                    'NUMBER OF DATA
230
240 REM    DIMENSIONS:
250     DIM B(38)
260
270 REM    MAIN PROGRAM
280
290 REM    READ IN N9 RANDOM NUMBERS, SORT THEM,
300 REM    AND PRINT THEM OUT.
310
315     LET X = 0
320     FOR I = 1 TO N9
330        LET B(I) = INT(RND*25 +1)
340        PRINT B(I);
350     NEXT I
360     PRINT
366     PRINT
370
380     FOR L = N9 TO 2 STEP -1
390        FOR I = 1 TO L-1
400           IF B(I) <= B(L) THEN 440
410            LET X = B(I)
420            LET B(I) = B(L)
430            LET B(L) = X
440
450        NEXT I
460     NEXT L
470
480     FOR I = 1 TO N9
490        PRINT B(I);
500     NEXT I
510     PRINT
520
530     END
```

*While the masculine pronoun is used throughout this article, the person referred to may be of either sex.

John M. Nevison, 3 Spruce St., Boston, MA 02108.

```
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```

Notice how the beheaded code is much more obscure. When the introduction is missing, the reader doesn't know whom to ask about the program. He doesn't know when it was written or why, or what the variables really mean. The odds are that he won't take the trouble to find out either. The program has a much better chance of passing by unexamined.

2. Never Comment Code

Even after the introduction has been stripped away, a program will frequently have scraps of comment dressing blocks of code. Expunge these notes mercilessly. Never give the reader any explanation beyond the code itself. Be careful to avoid any PRINT statements that might reveal what the code is doing.

3. Strain the Reader's Eye

What he can't see he can't understand. English has adopted many rules of spacing that the secretive programmer should avoid. The general practice of the secretive programmer should be donotuseaspaceifyoucan-avoidit.

The first kind of space to avoid is the blank line.

After the last REM statement is removed, only the heartiest of readers would brave this code. To the true secretive programmer, REM means REMove.

Sequential units of the program blur together when the blank lines are removed. The reader can no longer see quickly where one part ends and the next begins. Many Basics currently help the secretive programmer here by not allowing a blank line, but future Basics will allow this dangerous line. Guard against its use.

The second space to avoid is indentation.

```
220 LET N9 = 38
250 DIM B(38)
315 LET X = 0
320 FOR I = 1 TO N9
330 LET B(I) = INT(RND*25 +1)
340 PRINT B(I);
350 NEXT I
360 PRINT
366 PRINT
380 FOR L = N9 TO 2 STEP -1
390 FOR I = 1 TO L-1
400 IF B(I) <= B(L) THEN 450
410 LET X = B(I)
420 LET B(I) = B(L)
430 LET B(L) = X
450 NEXT I
460 NEXT L
480 FOR I = 1 TO N9
490 PRINT B(I);
500 NEXT I
510 PRINT
530 END
```

Indentation can reveal the most difficult logical feature of most programs: the loop. Remove indentation, and loops regain their rightful mystery. The reader must now ferret them out one at a time. In fact, with both blank lines and indentation removed from the program, the logical structure is completely hidden from the reader. He must take the program one line at a time and slowly construct his own guess at what the structure of the program might be.

The third space to avoid is line spaces.

The reader must now read each line one character at a time. Almost no one

```
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366PRINT
380FORL=N9TO2STEP-1
390FORI=1TOL-1
400IFB(I)<=B(L)THEN450
410LETX=B(I)
420LETB(I)=B(L)
430LETB(L)=X
450NEXTI
460NEXTL
480FORI=1TON9
490PRINTB(I);
500NEXTI
510PRINT
530END
```

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but the most die-hard fanatic will attempt to understand the program at this stage. The program's privacy is almost completely assured.

```
220LETN9=38
250DIMB(38)
315LETX=0
320FORI=1TON9
330LETB(I)=INT(RND*25+1)
340PRINTB(I);
350NEXTI
360PRINT
366PRINT
380LETL=N9
382IFL=2THEN530
390FORI=1TOL-1
400IFB(I)>=B(L)THEN450
410LETX=B(I)
420LETB(I)=B(L)
430LETB(L)=X
450NEXTI
455PRINTB(L);
460LETL=L-1
462GOTO382
530PRINTB(2);B(1)
535PRINT
540END
```

4. *Contort the Logic*

Structure is the secretive programmer's nemesis. By following the first three rules for obscure programs, the secretive programmer will frequently end up with contorted logic. Nonetheless, the code should be examined to be sure its logical flow is confusing. A little extra work can yield a lot of confusion.

Avoiding an easy-to-understand FOR-NEXT makes the program much more difficult to comprehend. The only thing this piece of code has in common with the original program is its output. Very few readers could verify that fact without running the code.

With these four simple rules of style, even the weakest secretive programmer can learn to hide his Basic program. The test of the truly obscure program is that it must be run on a computer to be understood. As a consequence, the secretive programmer, when confronted by an old piece of his own code, will be unable to guess why it was written or what it did. His confusion is his ultimate reassurance. For if he does not understand his own code, he can rest assured that no one else will.

Author Note

The author has been writing illegible Basic programs for thirteen years. A great deal of this time he was at Dartmouth College (where Basic was invented in 1964 by Thomas E. Kurtz and John G. Kemeny). Recently he has become a convert to writing well-styled programs and now refuses to read any of his own old programs. His articles have appeared in *Creative Computing* (Vol. 1, No. 1), *Science*, and the publications of the ACM. His new book, *The Little Book of Basic Style*, has just been published by Addison-Wesley. ■

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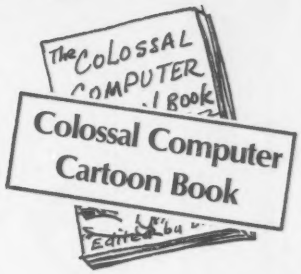

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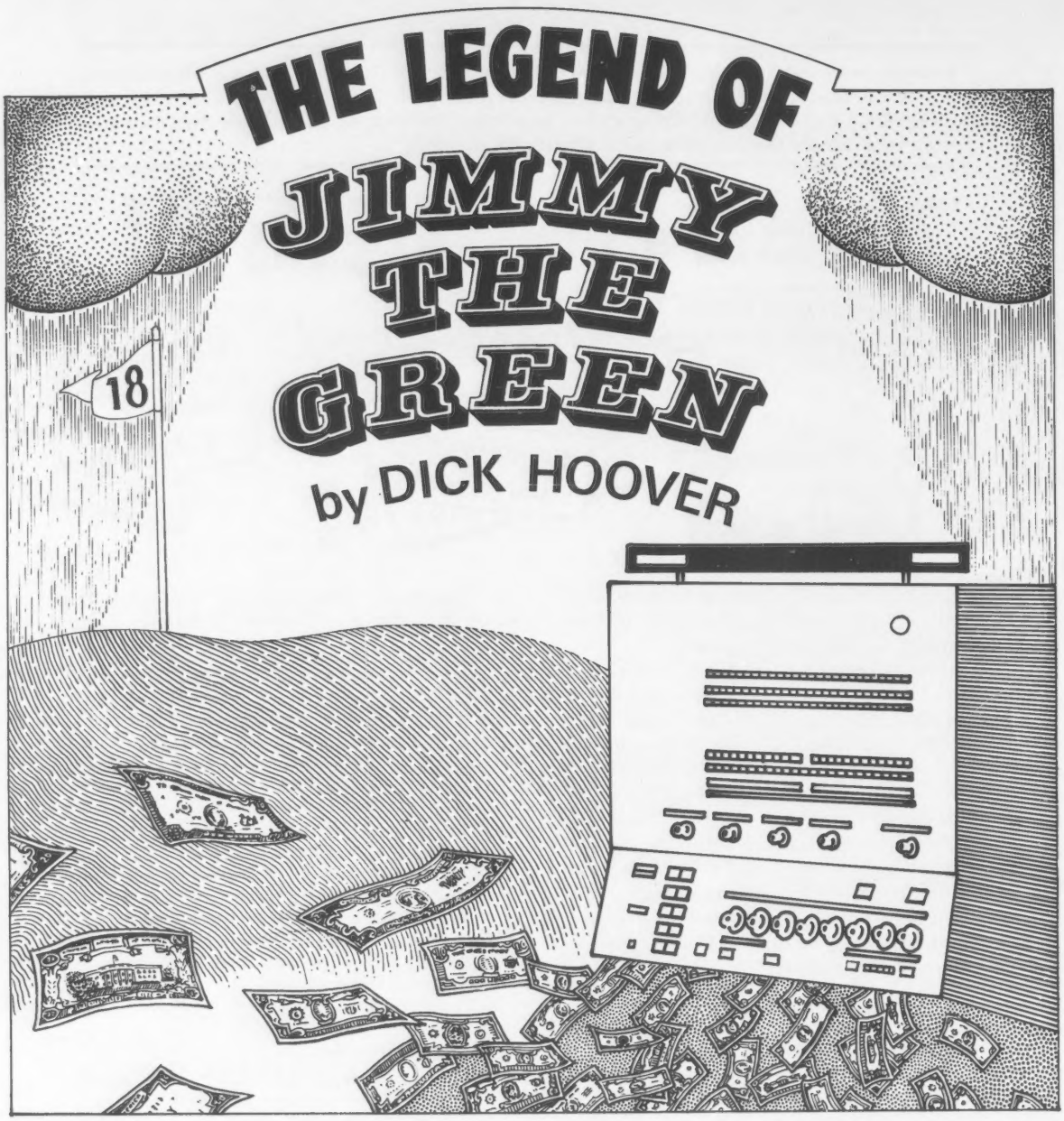
THE LEGEND OF JIMMY THE GREEN

by DICK HOOVER



I am not sure just when computer operators come up with the phrase "Garbage in — garbage out," but I suspect it is the year the men's club at Burnt Brush Golf Course begins feeding our scores into the computer to figure handicaps.

You see, Burnt Brush does not enjoy a reputation for having great golfers, or even very good ones. This is why I am so surprised the day Jimmy the Green tells me he challenges the August Country Club to an eight-man team match and sets the odds at 7-5 in favor of Burnt Brush.

"But why do you pick the August Club?" I ask incredulously. "That is a very classy club, indeed."

"Precisely," says Jimmy the Green confidently. "And according to my system, Burnt Brush has a team that can beat any team in the nation — providing I select the team members — so why not take on the best? It is simply good business."

It is several days before the August Club accepts the challenge, and I presume the delay is due to the well-known fact that Jimmy the Green does not make hasty challenges, his livelihood depending as it does on the outcome of such matters.

Jimmy the Green is the finest golf course tout I ever know. Of course, he is the only golf course tout I ever know, or even hear about, but he is a good one. Nobody knows how he does it, but give him a few hours to figure his system, and he will tell you almost every time who will win or lose a match, and he will set the odds to boot.

Well, when the August Club accepts the challenge, there is much rejoicing at Burnt Brush, not only because Jimmy the Green has picked us to win, but also because we are invited to play at their course, and an invitation to August is not easy to come by, never mind the home course advantage.

The wagers begin coming in, even before Jimmy the Green names his line-up, and understandably most bets say August wins. Now, when it comes to a dollar Nassau, even with automatic presses, we at Burnt Brush have great faith in Jimmy the Green's picks. But our faith waivers more than somewhat in the face of double sawbucks and occasional C notes put up by the August players who figure the match to be a romp.

It is a tribute to Jimmy the Green's belief in his own system, to say nothing of his bankroll which I do not realize the size, that he covers all wagers single-handedly. And it is a tribute to his reputation for honesty that he is allowed to hold the stakes.

On the day of the match I am shivering on the first tee at August Country Club, unprepared for the cold drizzle and chilly wind because only the day before the weatherman forecasts a warm, calm day. I am wondering how this will affect our team, when I hear the familiar "psssst" of Jimmy the Green.

He motions for me to join him, and I see that he also is caught unaware by the cold and wet. He is shaking and dripping in a thin polo shirt, holding a newspaper over his head with one hand and a large shopping bag with the other.

"I will be much obliged if you will hold the pot," says Jimmy the Green. "It is all here in the bag."

My eyes bug out at the sight of the bag, stuffed with greenbacks. "Are you sure you can trust me?"

He hands me the bag. "Any guy that loses as regularly as you do has got to be honest."

I thank him for the compliment. Then he gives me some special instructions, and I start to get worried.

"Win or lose," Jimmy says, "I plan to leave on an extended vacation. If I win, a gent named No-alibi Al will be by to collect my bundle. Give it to him. If I lose, the same gent will be by to collect my body. Give him my regards."

I am more than a little nervous wondering if this No-alibi Al is particular about which body he collects. But before I can protest, Jimmy the Green disappears, quicker than you can say pssst, and even before the match begins.

Well, the short of it is this: To everyone's surprise and my great relief, who should win the match but Burnt Brush. Immediately, a weird little guy with shifty eyes and a large suitcase sidles up to me and says "pssst." It is a menacing pssst that packs a lot of authority, so when he identifies himself as No-alibi Al and demands Jimmy the Green's winnings, I do not hesitate in emptying the shopping bag contents into his suitcase. He hurries away and I never see him again, which is the next-best thing to never seeing him the first time.

I am surprised that a classy club like August puts up such a fuss. They figure getting beat by Burnt Brush is impossible, if all is on the up-and-up . . . which many do not believe it is. There is a charge made that Jimmy the Green has tricked them.

Well, we ignore the cries of anguish from the losers and there is much celebrating around Burnt Brush, and for months to come Jimmy the Green is the toast of the clubhouse. Jimmy the infallible! The greatest judge of golfing talent!

But he is not around to collect his kudos. We presume he is off making his fortune picking winners on the professional tour. He becomes a living legend, so you can understand my excitement two years later when I stop by the clubhouse and from a dark corner of the cafeteria I hear "pssst."

"Jimmy the Green!" I hurry to his table. "How have you been?"

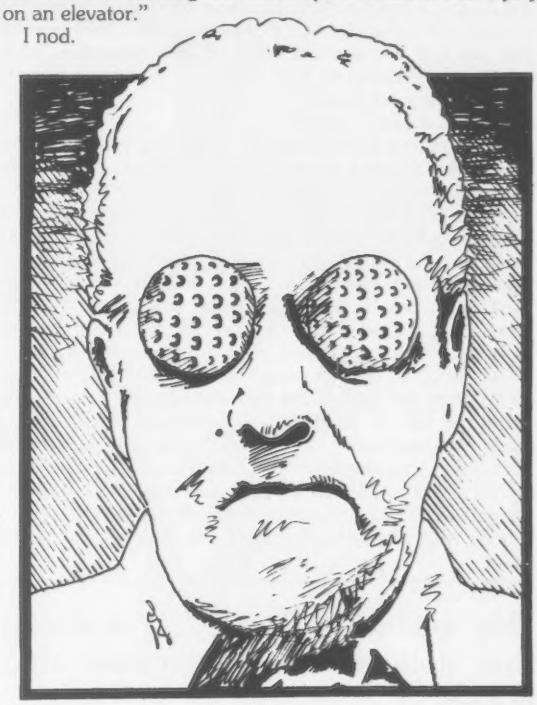
Right away, I am sorry I ask. Even in the dim light he does not look much like a living legend, which I would not expect to see wearing the same polo shirt he has on the day of the match.

He invites me to sit, and gets right to the point. "The story of the upset win by Burnt Brush spreads far and wide, and I keep hearing how Jimmy the Green somehow tricks the August Country Club, and that Jimmy the Green is nothing but a lowdown crook. I wish to set the record straight, once and forever. Will you hear me out?"

"Of course," I say, but first I try to cheer him up by letting him know that he is held in high esteem at Burnt Brush, by one and all. "None of us know how you did it, but picking Burnt Brush over August has to be the long shot of the ages. Our hats are off to you, Jimmy the Green."

He is not impressed. Pouring himself a fresh cup of tea, he begins like this: "Before I start hanging around here at Burnt Brush, I follow the horses for most of my 50-odd years, and this is a following with more ups and downs than a yo-yo on an elevator."

I nod.



"Well, it is during a prolonged downspell that my system predicts a sure long-shot winner. But I am having a serious case of the shorts so I make arrangements for a substantial advance from a gent that I do not normally do any business with. As it turns out, my system is only partly right. My pick IS a sure long-shot . . . but not a winner. So, for my health, I leave the track, planning not to return until I figure out why my system goes sour, and not even then unless I somehow gather enough legal tender to cure my serious case of the shorts."

I nod again, even though Jimmy the Green is not the easiest guy in the world to understand.

"I happen to stop at this clubhouse of yours for a cup of tea," he says, "and my misery loves company, which is abundantly provided by the golfers, about as miserable a bunch as I ever see."

"What is their problem?" I ask.

"They are down in the dumps — I hear from the conversations around me — because they never know from one day to the next how well they will score. I can identify with this because I also am never sure when I will make a good score either. I hear one guy say, 'If somebody could tell me why I shoot 85 one day and cannot break 100 the next, I'd give him a million bucks.' Now, such figures naturally draw my attention. Then I hear mention that some good bundles are being laid on a 'horse race' coming up, which I learn is not a real horse race but rather a competition among two-man golf teams, and it is then that I get an idea. The computer for figuring handicaps is the key."

"This is the first time I hear that you use the computer," I say.

"More on that in a moment," says Jimmy the Green. "Well, developing a system for this kind of horse race is a piece of cake. I get the field figured, place a pile on my choice, and make a very good score, indeed. It is on this day, when I am tucking the greens into my wallet, that . . ."

"We begin calling you Jimmy the Green," I recall.

"And also because none of you can pronounce my last name, Sandatrapolous. But from this moment on, I enjoy a good reputation as the club's ex-officio handicapper, as you know. I begin picking up some good scratch from my clientele who wish me to tell them such things as how well they will play and also the 'form' on their opponents, which is handy information to have when it comes to placing side wagers on the outcomes."

"Handy, indeed," I agree.

"But I am not making enough to meet a certain obligation I have with the gent of whom I speak to you about before. He has set a no-alibi deadline of June 1st."

I shudder at the recollection of my meeting with the gent.

"Consequently," Jimmy the Green goes on, "I am forced to go for the big bundle and it is then that I decide to run an eight-man team against the August Country Club. I figure there is no way I can lose because it is simply a contest between my system and no system at all, which is no contest."

"Do you mind if I ask how your system works?" I ask.

"At this point, I do not mind," he says. "My system is based on a theory that golfers are no different than horses in that some are natural 'mudders', while others comes through better on a dry track — or fairway if you prefer. It is also my theory that among golfers we have 'windjammers," who are at their best in a gale, and we have 'sunshine boys' who should not get out of bed if the temperature drops below 70."

"This is an interesting theory," I say, "but how did you test it?"

"My system is based on a theory that golfers are no different than horses . . ."

"The computer, as I say, is the key. I simply arrange to run the scores of Burnt Brush players through the computer, and feed in weather bureau data for the corresponding dates, back three years. What comes out is a complete form sheet on the players, not unlike the daily racing form. It reveals a clear pattern of performance, all based on the weather, as I surmise. In addition, the computer tells me something I do not even suspect. That is, that some golfers get out of the starting gate early, others hits their stride mid-way, while others have a strong finish."

"I do not understand," I confess.

"What this means is that some golfers have their best scores in the spring, others in the summer, and still others come on strong in the autumn stretch."

Jimmy the Green takes a long sip of tea. "And that is the long and short of my system, which I test successfully for many months at Burnt Brush. So, on the day before the match, I have three tentative teams on standby: the mudders, the windjammers, and the sunshine boys, all of them fast out of the gate. When the weatherman calls for no wind or rain and a high of 85, I summon my sunshine boys, feeling almost guilty it is so easy."

"But the weather turns out cold and wet, as I recall."

"Right." He shakes his head. "I fail to figure the weakest link in my chain to riches, the weatherman — may he someday be jabbed by his weathervane as he bends over his barometer!"

"And it is too late to switch teams," I commiserate.

"Indeed it is. What I need," says Jimmy the Green, "is a careful blending of windjammers and mudders, but I am left with my bundle, not to mention my life, riding on the sunshine boys."

"To this very moment, none of us realize your predicament on that day. How do you possibly arrange for the Sunshine boys to win?" I make no attempt to hide my excitement.

"The plain and simple truth is . . ." Jimmy the Green pauses and lowers his head. "I do not arrange anything. According to my system, those sunshine boys cannot beat their sick grandmothers on that day."

"And that is why you ask me to hold the bag?"

He nods agreement. "Precisely." Sipping the last of his tea, he gets up slowly to leave. "I am going back to the track where computerized odds are routine, and where the only weather condition that matters can be determined by a glance over the rail, right up to post time."

"What should I tell the guys at the club?"

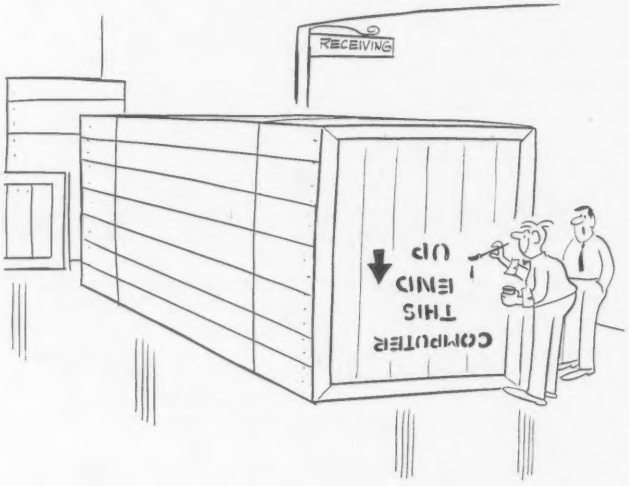
"Tell them that a system that cannot be trusted 100 percent is worse than no system at all, and can lead to nothing but a case of the shorts. This is the record I wish to set straight. Better that Jimmy the Green is remembered as a failure than as a lowdown crook. I will appreciate your spreading the word."

Jimmy the Green walks out of the clubhouse into a cold drizzle, one hand holding a racing form over his head.

It is a shaking experience to witness the death of a legend. I am so shaken, in fact, that it is several minutes before I realize that I forget to tell Jimmy the Green some very important news. I think he would have been impressed to learn that during his two years' absence, his sunshine boys — no doubt instilled with incomputable confidence as a result of being picked to win by the infallible Jimmy the Green — chalk up four straight victories over the August team . . . in all kinds of weather.

Some day soon I will spread the word about Jimmy the Green's system as he explained it to me. But not just now.

You see, before I run into Jimmy the Green, I place a rather large wager on the sunshine boys in their match tomorrow against the August Country Club. I want our team to remember that they are the pick of Jimmy the Green, and not to worry that the forecast calls for cold, gusty winds and rain. ■



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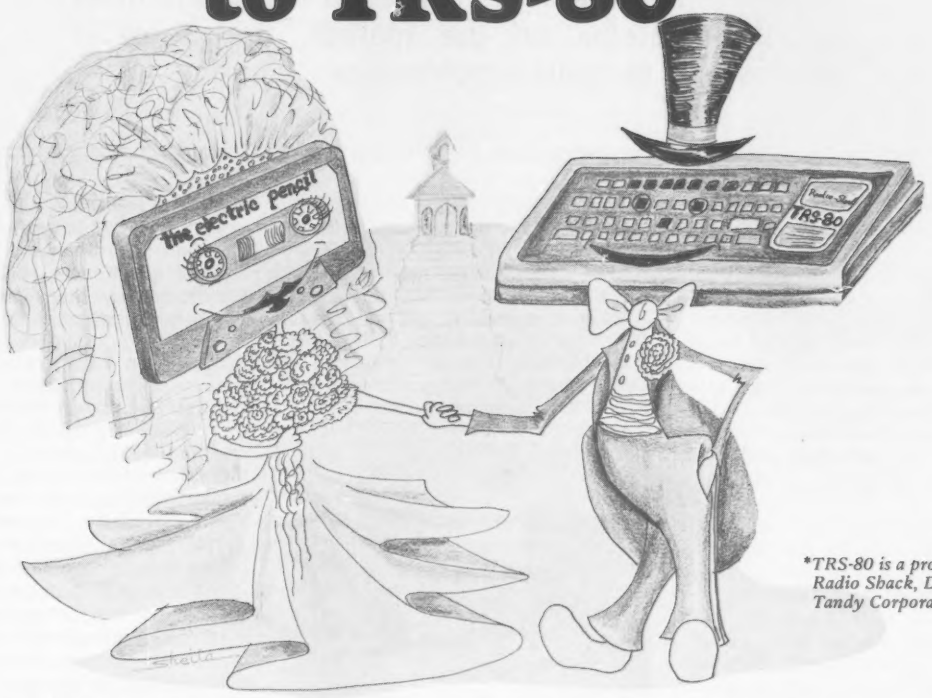

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CIRCLE 142 ON READER SERVICE CARD

A Creative Computing Equipment Profile. . .

The Boredom Destroyer: Exidy's Sorcerer

By combining the best features of two of the most popular systems on the market, the Sorcerer promises to be quite a contender.

Ken Barbier

The real grabber was what appeared to be an 8-track tape cartridge plugged into the side of the machine. As the salesman was quick to point out, the cartridge didn't contain tape — it held the BASIC language in read-only memory (ROM). And, in the future, other languages and utility programs would become available in the same format, so that they could be instantly swapped with the BASIC, simply by unplugging on cartridge and plugging in a new language. This feature, combined with a really extensive keyboard providing instant access to graphics as well as alphanumeric characters, led me to fall instantly in love with the Sorcerer Computer.

This was in April '78 at the PERCOMP convention in Long Beach, California. Sorcerer production was scheduled to begin in June. It was not until early in August that a new Sorcerer arrived on my doorstep. Read on and you will see if I think the wait was worth it.

Instant Computer

Little more than a year has passed since the initial deliveries of the first "take it out of the box and turn it on" microcomputer, the PET from Commodore. Shortly on its heels arrived the TRS-80 from Radio Shack. These computers are now readily available, and are supported by a mountain of software for both game playing and serious business use. Neither of these machines is perfect. The PET has a funny little keyboard that may be alright for one-finger pecking, but is pure agony for anyone who can type. The PET does include an adding machine/calculator type keypad, however, which greatly speeds up numeric data entry.

The TRS-80 has a real keyboard, but lacks the numeric keypad. The CRT display is TOO LARGE at 12" and has too few lines displayed at any one time. With Level 1 BASIC the TRS was alright for game playing, but was severely limited for any serious use. With the optional Level 2 BASIC installed, the Radio Shack computer is a fine machine for home or business use.

Both of these micros are readily expandable, but the choice of the IEEE 488 interface bus for the PET is questionable. This bus convention is found on expensive laboratory equipment, but it is not compatible with the peripherals available to the typical personal computer user.

Take a Sorcerer Computer, add a CRT monitor or modified TV set (as in this case) and a cassette recorder, and you have a complete microcomputer system. The Rom Pac cartridge plugged into the right side of the computer allows instant program swapping.

Enter the Sorcerer

Exidy, Incorporated,* a leading manufacturer of arcade type video games, aware of the shortcomings of these first two personal computers when it developed the Sorcerer, took full advantage of their experience. Exidy combined the really great graphics capability of the PET with the expansion flexibility of the TRS-80 and added its' own super feature, the Rom Pac™. The Sorcerer has a full typewriter keyboard with both upper and lower case letters displayed on the CRT, and when the word processing system becomes available, a quick swap of the cartridges will convert the machine into a smart typewriter, with the addition of a hardcopy device, of course.

Hardware Features

Anticipating this type of use, a 25 pin connector has been provided for 8-bit parallel input/output (I/O), so that a printer or typewriter type terminal can be instantly attached for hard copy. Also sharing the back panel of the Sorcerer's enclosure are a second 25 pin connector providing access to the dual audio cassette interfaces as well as an RS-232 serial data line for communicating with remote terminals. Completing this array of interface capability is a 50 pin card-edge connector which can be used to attach an S-100 (Altair type) expansion chassis.

The keyboard on the Sorcerer is one of the machine's outstanding features. Not just because it has a comfortable, solid feel, and features both upper and lower case. Actually, some keys have *five* distinct functions: upper case, lower case, graphic character, user defined graphic character and single keystroke entry of BASIC statements.

This latter feature allows a non-typist to key in a BASIC program about as fast as a typist could. Access to each of the five function levels is through the use of the SHIFT and GRAPHIC keys. With neither pressed you get a lower case letter. SHIFT gives upper case, as on a typewriter. GRAPHIC provides access to the 8 by 8 dot matrix built-in graphic characters. SHIFT and GRAPHIC keys together provide access to a user defined 8x8 dot character, provided he has previously entered the bit pattern into RAM memory. When BASIC is running, or is in the command mode, the combination of the GRAPHIC and a letter key will produce a complete BASIC statement or command (GOTO, CLOAD, etc.). In spite of this, BASIC still has access to the graphics characters. If you want your BASIC program to display a graphic character, it would be entered between quotes (as in: LET A$ = "L⊿") in which case the GRAPHIC key in combination with another key will produce the graphic character rather than the BASIC statement.

Ken Barbier, Borrego Engineering, PO Box 1253, Borrego Springs, CA 92004.

*969 West Maude Ave, Sunnyvale, CA 94086

Hard Software

Computer programs used to be referred to as "software." However, with the introduction of higher level languages in ROM, "firmware" is a more descriptive term. Programs on tape can still be called "soft." The nice thing about firmware is that it is instantly available. No five minute wait for a tape to load.

In addition to the BASIC language in Rom Pac, the Sorcerer comes with an extensive monitor program in ROM on the CPU board, where it is always available. This monitor handles all the I/O for the Rom Pac language, so it can be used to reassign the input or output operations for BASIC in the event a peripheral terminal or printer is used. At the machine language level the monitor provides the usual operator access to memory for dumping or changing memory locations. There are also commands for reading and writing to either of the tape interfaces, and even tapes written by BASIC can be loaded from the monitor. A "batch" mode is also available, which allows the operator to create a tape containing a series of commands, which the monitor can then execute one at a time.

For example, assuming two cassette drives are used, with the motor on-off controls connected, a batch tape can be created which will load a BASIC or machine language program, run the program, return to the monitor batch mode, load another program, execute it, etc. Using this feature, programs which are too big to fit in memory at one time can be loaded and run in sequence without operator attention.

The BASIC supplied with the Sorcerer is an 8K version which is more powerful than Radio Shack Level 1 but falls short of PET or Level 2 capabilities. It has no double precision option, PRINT USING, EDIT, or AUTO line numbering. The lack of double precision can seriously limit business use of the machine.

Expansion: Optional

While it is nice to know that the connector is there on the back panel, and that an expansion chassis is available to connect it to, the features already included with the Sorcerer make you wonder if expansion will ever be required. RAM can be expanded to 32K *on board*. Two tape decks with automatic motor control plug right in. An 8 bit parallel input and an 8 bit parallel output port are built in along with a bidirectional RS-232 interface. These features permit a computer system configuration quite capable of handling serious business data processing without expansion. If you insist... go ahead and add a couple of disc drives and a speech synthesizer and an X-Y plotter, or any of the other S-100 bus compatible peripherals already on the market. Sorcerer is ready when you are!

The "So Who's Perfect?" Department

Professor Gilmauch Crimwaddy's Second Law of Static Dynamics states that "Version 2 (of anything) is the first version that really works." This is quoted here not to challenge Fundamentalists or the First Book. It is merely to point out that when you insist on ordering a machine before it is even in production, you can expect to find something wrong somewhere. Let's see what one customer found.

My Sorcerer was the fifteenth off the production line. It was unpacked and placed on the kitchen table. A Hitachi 9" monitor was connected to the VIDEO OUT jack. No monitor is included with the Sorcerer, allowing the user to select a screen size compatible with his glasses prescription. The BASIC Rom Pac was inserted and the POWER switch activated. Sorcerer came up running, and informed me that I had 7400 bytes available. The rest of

the 8192 bytes of RAM that come with the machine are used by BASIC and the monitor. The 7400 left for the user is plenty. It will take a while to fill them up.

The first three weeks of Sorcerer's life were devoted to constant activity. It moved around locally. It took a 500 mile trip in the trunk of my car. It was used by nine year olds and up. It was asked to display its' 30 lines of text on a high resolution monitor and on a cheap TV set. It was required to talk to several different inexpensive cassette recorders. Its interface ports were probed by scope, although real peripherals were not yet available for the acid test. All seems in order. Yet, no one is perfect.

The SHIFT LOCK key refused to keep the keyboard in upper case. This is important to BASIC, which will accept strings in lower case but wants statements in upper case. One of the many users discovered that by pressing down and slightly to the right on the keytop it could be made to work reliably.

This was the *only* hardware deficiency with the Sorcerer. It can hardly be

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called a "failure," merely an inconvenience. There are a couple of minor deficiencies with the "firmware." While a long BASIC listing is flashing past on the screen, the CTRL 0 function does not serve to pause the listing, as the manual implies it should. That covers the problems with the BASIC language.

The advertising brochure which I picked up in April stated that the monitor program allowed the operator to examine and alter registers and set breakpoints. The manual that arrived with the computer doesn't mention these functions. Perhaps they are there, but the writer forgot them. If so, he could have been the same writer who neglected to mention how to implement the BASIC USR function, whereby an assembly language routine can be called by a BASIC program. So much for the deficiencies in documentation.

This Exidy Sorcerer has been given a really hard workout since it arrived. You have to be a real nit-picker like me to find these few minor problems. It would appear that Exidy, Inc., has disproved the Second Law. Version 1 of the Sorcerer is a near perfect product.

Putting Sorcerer to Work

This computer was acquired for a purpose: to prove (or perhaps disprove) the contention that an under $2000 computer system can earn its keep in a small business environment. No disc drive or expensive printer will be used. No all-encompassing high powered general ledger program will be used. Small businesses of the Mom and Pop variety cannot and will not modify all of their bookkeeping practices to conform to the requirements of the general purpose accounting software packages. There are a myriad of other tasks which a small computer can perform in order to earn its keep. The Sorcerer will be assigned these tasks, one at a time. Within hours of its arrival it had performed the first. As the photograph of the TV set display shows, the computer was used to generate a pseudo-random set of key patterns to be used to master-key a motel. (Burglars please note that the patterns shown are not those actually used.)

With two tape interfaces and a printer port built in, this computer can perform real data processing tasks. One of its first assignments will be to generate a customer account data base. In succeeding months it will be required to update the account records and print monthly statements. These tasks are well within the capabilities of the basic machine, with no expansion chassis or disc system required.

Conclusions

With its super set of built in features, the Exidy Sorcerer stands head and shoulders above its competition. But, since it does not come with CRT monitor or cassette tape recorder, it also costs more than the competition. The extra expenditure for the Sorcerer, as compared to the Radio Shack or Commodore computers, can only be justified on the basis of the more serious use of the machine and taking advantage of its special features. This makes the lack of double precision arithmetic and extended features of BASIC all the more serious.

Assuming a future upgrade to a 12K extended BASIC, this machine could become a near perfect small computer for business use. As it stands now, it is the best choice for the serious hobbyist or experimenter. ■

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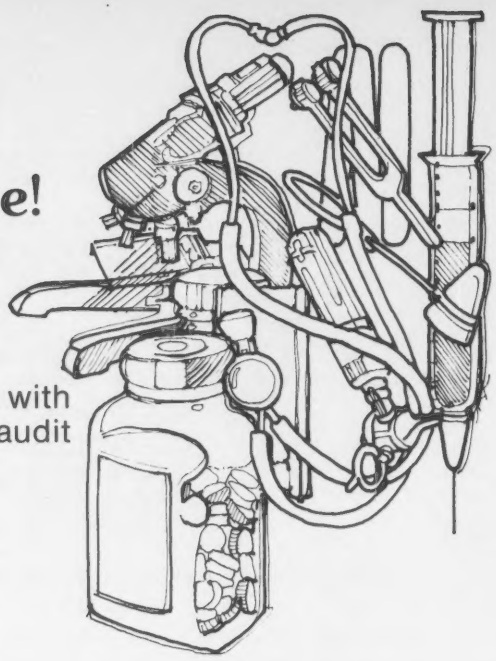

A useful program for large and small hospitals, with a TRS-80, for collecting and analyzing medical audit data.

Medical Audits are retrospective reviews of hospital charts in cases with common diagnoses, treatments or tests. The various regulatory agencies feel that a well designed Medical Audit can indicate problem areas to which educational efforts can then be directed. The JCHA (Joint Committee of Hospital Accreditation) and the PSRO (Professional Service Review Organization) have ordered increased use of Medical Audits at institutions coming under their jurisdiction. Currently our medium sized community hospital is required to prepare eight of these each year. We have designed a TRS-80 program for our record room personnel to aid them in the compiling of the audit data. They have found using the TRS-80 a cost effective time saver compared to the previous manual method.

The Auditing Procedure

The usual audit may be a specific number of case chart reviews, usually 50 to 100. Alternately, it might include all those charts meeting the design criteria over a given time such as a six to twelve month period. Three separate steps are necessary in performing a Medical Audit. First the responsible individual (or committee) must decide what disease, operation, treatment or laboratory test is to be studied. A list of appropriate questions must then be prepared. Professional publications are available with guidelines to assist in drawing up these questions. Most of them require only a yes/no answer. The final summaries are concerned with the percentage of cases which do not meet

Figure 1

MEDICAL AUDIT STUDY WORK SHEET

Title: APPENDECTOMY

PATIENT NUMBER _____ PHYSICIAN NUMBER _____

ELEMENTS TO BE REVIEWED	Standard	Standard met	Standard met thru exception	Variation
Diagnosis: 1. Positive Appendix	100%			
Justification: As above	100%			
LOS: 2. Min. 5 days				
3. Max 11 days				
Disch: 4. Ambulatory	100%			
5. Appetite	100%			
6. Normal Bowel movement	100%			
7. Follow up	100%			
Critical process:				
8. Pelvic exam	100% females			
9. Rectal exam	100% males			
Complications:				
10. Perforated	0%			
11. Wound infection	0%			
12. Mortality	0%			

Use reverse side for HRA explanations and Audit Committee comments
ALL VARIATIONS MUST BE REFERRED to committee for review
Identify variations by element No.

Charles Hemminger, M.D., 20 Harrison Ave., Northampton, MA 01060.

the established standard. Other information most always desired for analysis by the JCAH is the age distribution, the length of stay (LOS) range and the sex division. Often an audit may include a survey of which physician sees the majority of patients. Figure 1 is a copy of the information requested in an audit of appendectomies prepared at our hospital.

After the study questions are formulated, the patient's charts are made available for review by the record room clerk. Formerly an individual sheet was prepared for each case and marked with the appropriate findings. The clerk would then total up the responses to each question from each sheet and calculate the percentages. In addition, summaries for the patients of each sex, age group, length of stay and physician category would be hand compiled.

The third part, that of analyzing the completed data is, of course, the responsibility of the reviewing individual. Extracting meaningful conclusions obviously takes practice and experience. A typical data display form and Study Summary is shown in Figures 2 and 3.

The Program

The record room clerk must still abstract the necessary answers from the charts, but obviously the computer can help compile the data. We have chosen the TRS-80 because it has an attractive price and is readily available. For convenience the program itself was devised on a larger microprocessor using the constraints of the 4K BASIC of the TRS-80. The larger memory, renumbering and edit commands greatly expedited the work. The major limitations are the one single dimensioned array A(400) and only two string variables A$, B$ limited to 16 characters. It was also found that nested GOSUBs are not allowed. A nice feature, however, is the ability to format using the PRINT AT statement rather than scrolling. This allows one question after another to be displayed on the same space in midscreen. The scrolling method is retained for the various summaries. Certainly having a printer available would be preferred to hand copying the summaries, but that is left for future expansion.

Using the READ, DATA, RESTORE scheme permits the displaying of the questions previously entered by the clerk as DATA. The yes/no response is then stored in an array. The single array of the TRS-80 4K BASIC does not require a DIM statement. We have divided this single array into several segments which are then used as storage for the collected data (Table 1).

As presently structured the program allows for up to 49 yes/no questions to be initially entered. From the patient's birth date and admission date, the patient's age is calculated and stored by decades in A(100-110). Likewise, the discharge date is entered and compared with the admission date to determine the length of stay. This is stored in A(200-260) up to the arbitrary cutoff at 60 days. Finally the physician code number is entered and stored in the array at A(111-155). The number of cases for each physician then goes into A(156-199).

Modified top-down programming is used so that a new subroutine can easily be added if other information is to be collected. A possible example is an audit including a question concerning the range of hemoglobin values. First a new GOSUB statement and the appropriate subroutine would be entered into the program. Next the case summary would be modified and an additional final summation routine setup.

The full multi-line version without syntax abbreviations is presented so that the program can be understood and translated to other computers if desired. This takes almost 4K including the REMarks and will not fit the 3583 bytes of a 4K TRS-80 and allow for DATA statements and operation. A

Figure 2

2A DATA DISPLAY — TOPIC: APPENDECTOMY — # RECORDS: 50 — DATE: 1978 — pep UCAH

AGE/SEX DISTRIBUTION

Age Range	# Males	# Females	Total
0-9	10	8	18
10-19	10	8	18
20-29	1	2	3
30-39	4	2	6
40-49	0	2	2
50-59	2	1	3

LENGTH OF STAY DISTRIBUTION

LOS Range	# Patients
1-3 days	22
4-6	15
7-9	7
10-12	1
13-15	3
16-20	2

PHYSICIAN/OTHER PROFESSIONAL/UNIT DISTRIBUTION

Phys Code #	# Patients	Phys Code #	# Patients	Prof Code #	# Patients	Unit No.	# Patients*	# Discharges	# Deaths
2	1								
26	3								
27	13								
40	1								
58	9								
68	6								
135	3								
150	4								

PRELIMINARY DATA (Before committee review) / FINAL DATA (After committee review)

CRIT. NO.	# Meeting Element + Standard	# Meeting Exception	TOTAL #	TOTAL %	# Passing Committee Review	TOTAL #	TOTAL %	# Not Passing Committee Review
1	50	-	50	100				
2/3	45	-	45	90	5	50	100	
4	50	-	50	100				
5	6	-	6	12	0	6	12	
6	29	-	29	60	0	29	60	
7	18	-	18	36	0	18	36	
8	42	-	42	84	8	50	100	
9	45	-	45	90	0	45	90	
10	6	-	6	12	0	6	12	
11	4	-	4	8	0	4	8	

TOTAL PHYS/UNITS/PROFS

Physicians in study: 8
Nursing units in study: 1
Total _____ Discharge _____
Other professionals in study

Discipline	#	Discipline	#

COMMITTEE INFORMATION ITEMS

Item	#	%
Pelvic Exam not done	50	100
	-	-
Rectal Exam not done	5	10
Physician 58 3/9		
Physician 150 2/14		

Death

COMPLICATIONS

CRIT. NO.	#	RATE (%)	# Not Meeting Critical Management	# Passing Committee Review	# Not Passing Committee Review
10	6	12		6	
11	4	8		4	

*If patients were cared for on more than one nursing unit the number of patients distributed will exceed the total number of patients in the study. However the # Discharges should equal the # Records in study.

1978

shortened version with multiple statements per line using abbreviations and no spaces is required. The P.M. command will read 1469 with the abbreviated version. This tight memory restriction also forced us to prepare the operating instructions for the record room personnel on a separate paper, rather than printing them on the computer.

System Operation

Since this program is designed to allow the clerk to enter the predetermined questions as DATA using the line number and the D. abbreviation, it is quite flexible. Many different audits can be done without help from the original programmers.

The 4K BASIC does not initialize variables to zero so this is performed in Lines 70-150. Should this program be used with other BASIC interpreters, a DIM A(260) statement will probably be necessary.

The chart number is entered as B$ since many charts have alphabetic as well as number coding. This number is not retrievable in this program the way it is now written. The patient's sex is entered, followed by the birth date and admission date. After the discharge date is entered, a formula is used to calculate the length of stay. This formula is correct for the various months and leap years. Because the TRS-80 may overflow the calculation we have elected to begin the computation at 1972.

The main program continues after these subroutines. The various questions are READ and PRINTed. The response to each question is stored temporarily in A(I). This array is used over and over.

An optional case summary can then be obtained and either rejected or approved. Should an error be detected, the whole case must be re-entered. If the information is correct, it is then added to the various array locations previously reserved.

The operator is allowed to precede with the next case. If there are no more cases, a final summary is displayed. The age summary, length of stay summary and physician summary are separately presented for easier reading.

This practical program is an example of the use of a microprocessor by an organization which had not previously felt the need for computerization. Because the computer is now reasonably priced and bureaucracy is building, perhaps this is just a prototype of such programs. ■

Figure 3

4 STUDY SUMMARY

DATE October 28, 1978

pep JCAH

Committee
Quality Assurance Comm.

Topic
Primary Appendectomy

Objectives
To determine diagnostic acumen
To look at LOS, proper follow up and physical examinations
Are Complications being treated correctly?

Number of physicians in study 8

Number of nursing units in study

Number of other professionals in study

Discipline	Number	Discipline	Number

[X] Original study [ ] Repeat study Date of last study

Number of records 50

Selected from ... to

Proposed date for complete restudy

Basis for decision

NARRATIVE SUMMARY OF STUDY (Include problems that require action by the governing body)

The study demonstrated that there is a very accurate diagnostic ability in this study. All the cases reviewed has a cut appendicitis pathologically. The LOS was low primarily because the age group was under 30.

There was a minor problem with regards to rectal examinations and those particular physicians have been consulted regarding their decision not to examine this area pre-operatively. In both cases these physicians did do rectal ecaminations on other patients.

There was a 12% rate of perforation which will be reviewed by the surgeons and a process audit may be conducted. This does not infer delay on anyones part but just the fact that more information is needed. Documentation is a chronic problem not limited to this institution and has been reported to the proper groups with hopes of improving the charts. It should be emphasized that documentation and quality of care do not necessarily go together, but it makes auditing easier.

Committee Chairman

Executive Committee Chairman

Administrator

Department/Service Chairman(men)/Director(s)

Nursing Service Director

Governing Body

1978

Table 1

Array Storage Table

A(I)	Response to questions each pass
A(I+Q)	Storage of total responses each question
A(100-110)	Age Summary
A(111-155)	Physician numbers storage
A(156-199)	Physician cases
A(200)	Over 60 days stay
A(201-260)	Stay of 1 to 60 days

Table 2

List of variables

Q	=	Number of questions
J	=	Number of cases
L	=	Number of males
F	=	Number of females
T	=	Total length of stay all cases
W	=	Number of physicians
U	=	Maximum length of stay
S	=	Sex
P	=	Physician
B$	=	Chart number
A$	=	Question READ from DATA
G	=	Age of patient
R	=	Length of stay
O	=	Days from 1972 to admission
H	=	Days from 1972 to discharge
N,E,Z	=	Date of birth: Months,days,year
M,D,Y	=	Admission & Discharge: Months,days,year

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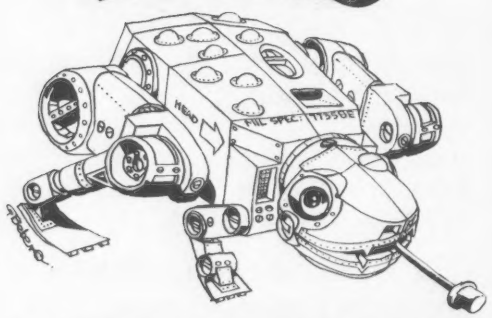

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Medical Audit Program

```
Instructions for using the TRS-80 Medical Audit Program

1. Be sure the cord is plugged into the outlet.
2.   Turn power switch on TV to ON.
3.   Turn power switch in back of Keyboard to ON.
4.   The TV should display the word READY.
5.   Type the letters NEW, then press the ENTER key.
6.   Put the program cassette into the cassette recorder.
7.   Push down the PLAY switch.
8.   Type the letters CLOAD (without spaces) then the
     ENTER key.
9.   An asterisk (*) should flash in the upper left corner.
10.  When this stops and READY reappears, you can enter
     your questions as follows:

       First type a number, then D., then the question
        and finally stike the ENTER key.
          1D.RECTAL BLEEDING
          2D.ABDOMINAL PAIN
                    .
                    .
                    .
          12D.MORTALITY
       Be sure to start with a number (1) the letter D
       then a period(.) followed by the question.
       Maximum of 16  characters in each question please.
11.  Now type 50 Q=(number of questions): e.g.: 50 Q=12
12.  Strike ENTER, then type RUN and ENTER key.
13.  The program is now ready to operate.  Follow the
     instructions as they are given.
14.  For all yes/no answers: 1 = Yes, 0 = No.
```

Medical Audit Program Listing

```
10 REM MEDICAL AUDIT PROGRAM
20 REM BY CHARLES HEMMINGER, M.D.
30 REM & JOSEPH TARANTINO, M.D.
40 REM 1-49 RESERVED FOR DATA QUESTIONS
50 REM RESERVED FOR Q=NUMBER OF QUESTIONS
60 J=0
70 L=0
80 F=0
90 T=0
100 W=1
110 U=60 : REM UPPER LIMIT OF STAY
```

```
120 FOR I=1 TO 260
130 A(I)=0
140 NEXT I
145 REM MAIN PROGRAM
150 CLS : REM CLEAR SCREEN
160 J=J+1
165 REM GET DATA
170 GOSUB 800
175 REM CALCULATE LENGTH OF STAY
180 GOTO 1000 : REM NESTED GOSUB NOT ALLOWED
190 FOR I=1 TO Q
200 READ A$
210 PRINT AT 392:I;". ";A$;"  ";
220 INPUT A(I)
230 IF A(I)=0 THEN 270
240 IF A(I)=1 THEN 270
250 PRINT AT 517;"PLEASE USE 1 FOR YES, OR 0 FOR NO"
260 GOTO 220
270 PRINT AT 517;" " : REM CLEARS ERROR MESSAGE
280 NEXT I
290 RESTORE
295 REM CASE SUMMARY
300 GOSUB 1200
310 INPUT "ANOTHER CASE ";X
320 IF X<>1 THEN 340
330 GOTO 150
335 REM FINAL SUMMARY
340 CLS
350 PRINT TAB(22);"FINAL SUMMARY"
360 PRINT
370 PRINT "FEMALES = ";F,"MALES = ";L
380 FOR I=1 TO Q
390 READ A$
400 PRINT I;"."·A$;((A(I+Q)/J)*100);" %"
410 NEXT I
420 PRINT
430 INPUT "AGE SUMMARY (TYPE A NUMBER) ";X
```


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CIRCLE 195 ON READER SERVICE CARD

```
440 PRINT
450 FOR K=0 TO 80 STEP 10
460 PRINT K;" - ";K+9;" = ";A(K/10+100)
470 NEXT K
480 IF A(110)>0 THEN PRINT "OVER  89 = ";A(110)
490 PRINT
500 INPUT "LENGTH OF STAY (TYPE A NUMBER) ";X
510 PRINT
520 FOR K=1 TO U
530 IF A(200+K)=0 THEN 550
540 PRINT K;"DAYS = ";A(200+K)
550 NEXT K
560 PRINT "OVER ";U;" DAYS = ";A(200)
570 PRINT "AVERAGE STAY = ";T/J
580 PRINT
590 INPUT "PHYSICIAN SUMMARY (TYPE A NUMBER) ";X
600 PRINT
610 FOR I=1 TO W-1
620 PRINT "PHYSICIAN # ";A(I+110);" = ";A(I+155)
630 NEXT I
640 END
795 REM DATA ENTRY
800 PRINT AT 25;"ENTRY ";J
810 PRINT AT 128:"CHART NUMBER ";B$
820 INPUT B$
830 PRINT AT 192:"PHYSICIAN  # ";
840 INPUT P
850 PRINT AT 222;"SEX (1=FEMALE, 0=MALE ) ";
860 INPUT S
870 PRINT AT 512:" "
880 IF S=1 THEN 920
890 IF S=0 THEN 920
900 PRINT AT 512;"YOU HAVE MADE A MISTAKE"
910 GOTO 850
920 PRINT AT 320;"DATE OF BIRTH ";
930 INPUT N,E,Z
940 PRINT AT 350;"DATE OF ADMISSION ":
950 INPUT M,D,Y
960 G=Y-Z
970 IF N>M THEN G=G-1
980 RETURN
995 REM CALCULATE STAY
1000 GOSUB 1070
1010 O=H
1020 PRINT AT 384;"DATE OF DISCHARGE ";
1030 INPUT M,D,Y
1040 GOSUB 1070
1050 R=H-O
1060 GOTO 190
1070 Y=Y-1972 : REM MUST BE A LEAP YEAR
1080 IF M>2 THEN 1110
1090 H=365 * Y + D + 31 * (M-1) + INT((Y-1)/4) - INT(.75
     * (INT((Y-1) /100) + 1)))
1100 GOTO 1120
1110 H=365 * Y + D + 31 * (M-1) - INT(.4 * M + 2.3)
     + INT(Y/4) -  INT(.75 * (INT(Y/100) + 1))
1120 RETURN
1195 REM CASE SUMMARY
1200 PRINT AT 640;"DO YOU WANT A SUMMARY OF THIS CASE ":
1210 INPUT X
1220 CLS
1230 IF X<>1 THEN 1420
1240 PRINT TAB(15);"CASE SUMMARY"
1250 PRINT
1260 PRINT "CHART NUMBER ";B$,"AGE ";G,"SEX ";
1270 IF S=0 THEN PRINT "MALE"
1280 IF S=1 THEN PRINT "FEMALE"
1290 PRINT "LENGTH OF STAY ";R,"PHYSICIAN # ";P
1300 PRINT
1310 FOR I=1 TO Q
1320 PRINT I;". "·
1330 IF A(I)=1 THEN PRINT "YES",
1340 IF A(I)=0 THEN PRINT "NO",
1350 NEXT I
1360 PRINT
1370 INPUT "IS THIS DATA CORRECT ";X
```

```
1380 CLS
1390 IF X=1 THEN 1420
1400 GOTO  170
1415 REM SUM DATA FOR EACH CASE
1420 IF S=0 THEN L=L+1
1430 IF S=1 THEN F=F+1
1440 FOR I=1 TO Q
1450 IF A(I)=1 THEN A(I+Q)=A(I+Q) + 1
1460 NEXT I
1470 IF G>89 THEN A(110) = A(110) + 1
1480 FOR K=0 TO 80 STEP 10
1490 IF G<K THEN 1520
1500 IF G> =K THEN 1520
1510 A(K/10+100)=A(K/10+100) + 1
1520 NEXT K
1530 T=T + R
1540 FOR K=1 TO U
1550 IF R=K THEN A(200+K)=A(200+K) + 1
1560 NEXT K
1570 IF R> U THEN A(200)=A(200) + 1
1580 FOR I=1 TO W
1590 IF A(I+110)=P THEN 1640
1600 IF A(I+110)=0 THEN 1620
1610 NEXT I
1620 A(I+110)=P
1630 W=W+1
1640 A(I+155)=A(I+155) + 1
1650 RETURN
```


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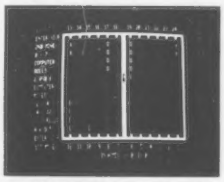

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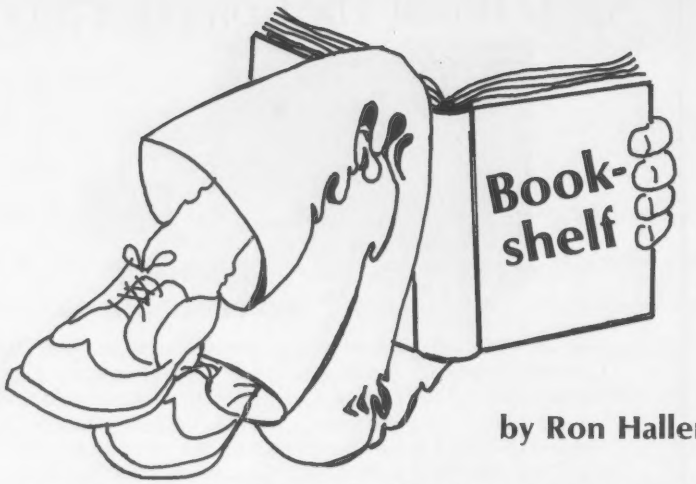

by Ron Hallen

How to Profit from Your Personal Computer, T. G. Lewis, Hayden Book Company, Rochelle Park, New Jersey. Softbound, 192 Pages, $7.95.

I would suppose that many, if not most, computer hobbyists consider the possibility, at one time or another, of making money with their machines. Other than the fact that a fair amount of cash has been invested, a hobby that makes a profit is certainly a desirable goal.

I use my computer to help with my writing but it hasn't gotten to the point where it is paying for itself yet, especially since I keep adding to my investment. Therefore, when I saw the title, "How to Profit from your Personal Computer," in Hayden's brochure, I knew that I had to have a copy.

After a first reading, I was left with the question, "Who is this book aimed at?" In the beginning it seems to be written to interest the newcomer but when it gets deeply into programming, it appears to have the advanced hobbyists in mind. Yet the main theme seems to be that it would be to the advantage of a businessperson to have a computer to do his accounting, billing, mailing, record keeping, inventory control, etc.

Is it possible for one book to be all of these things and to do them all well? I decided to read it again and see. "How to Profit" starts out with an introduction to computers, goes into solid state theory, and then jumps to memory and I/O. All of this in the first chapter. Unfortunately, only enough information is given to confuse and not enough to educate. The quality of the photographs in this chapter is very poor. I think that the book would have been much better off without the first chapter. It gives the wrong idea of the contents of the rest of the text and might keep some readers from going farther into it.

Chapter 2 discusses the disadvantages of batch and time share processing and leaves the impression that none of the problems mentioned apply to personal or business microprocessors. However, memory can fail, disks can be accidentally erased and components can die in any system. Still I agree with Lewis that the in-house system is probably the most viable for small businesses.

Chapter 3 uses up more pages explaining the binary number system and CPU architecture. I'm sure that most of the readers of this book will use BASIC and that this is therefore unnecessary information. Again, not enough instruction is given to do more than confuse. This chapter also goes into some of the limitations of microprocessor based systems, talks about peripheral requirements, and how to figure out what you need and where to get it. Now we're getting into the real meat of the text. From here on out, we'll be looking at real life situations and practical solutions. Each situation is presented in narrative form. In other words, we will be looking at people and their problems.

Tow Swift's Motorcycle Shop and its inventory and record keeping problems are presented and a visit to a computer store follows. Dr. Goode's Medical Clinic is having a terrible time with its billing. Dr. Goode also ends up at the computer store.

Mr. J owns a string of Saving & Loan Associations. He has a large central computer to handle all data processing and record keeping but it is getting overloaded. Is a bigger brain the answer or does each S & L office need its own local computer to do the more trivial but necessary daily tasks. A computer consultant is called in to answer this question.

More situations are presented and solutions suggested. Each solution is part hardware and part software but the emphasis is on BASIC language programs. Each program is written in three steps or levels. First an English language outline, second an outline written halfway between English and BASIC, and finally the BASIC program itself.

A lot of good discussion on BASIC programming is provided. I especially like the debugging procedures. A probe is inserted into a program whenever you want to determine if a variable that you don't normally see is correct. I've been doing something similar by printing variables at intervals while designing programs. Sorting and merging is also covered thoroughly.

The problem solving programs presented include loan payment schedules, mailing lists, accounts receivable, inventory, household accounting and real estate multiple listings. Complete programs are provided, debugged and discussed. Each of these is usable as written but modification information is also given. A nineteen page glossary of terms at the back of the book will be most helpful to the computer novice.

Chapter six discusses numerical and string arrays, but string arrays are described incorrectly. What is identified as a string array is in effect a string variable that allows a given segment to be entered or removed.

The last chapter is an attempt to see into the future, specifically 1984 and 1994, and to describe the influence that personal computing will have on us by then. For the most part, the hardware predictions are extensions of present technology and nothing new is offered. Faster processors, multiple processors, computers tied together in networks and more compact cheaper memory are some of the predictions. I'll save the prophesied effects on our lives for you to read. Happily, they were not inspired by George Orwell.

As I said earlier, I'm not sure who this book is aimed at. There is too much technical information and programming for the businessperson who is trying to decide if a personal computer will help his business or not. Yet, business applications are shown in a very good light.

There is a lot of good information for the hobbyist who might be interested in writing business software. The hobbyist who plans to remain a hobbyist might find less to interest him but then again some of the business software has home applications as well. There seems to be something for everyone.

So if I haven't really answered the question I started out with, it's because I don't think that there is one specific answer. I feel that just about everyone will get something out of "How to Profit from your Personal Computer" and I think that it is well worth the price. ■

How to Profit From Your Personal Computer is available from the Creative Computing Book Service, P.O. Box 789-M, Morristown, NJ 07960 for $7.95 plus $1.00 shipping ($2.00 foreign)

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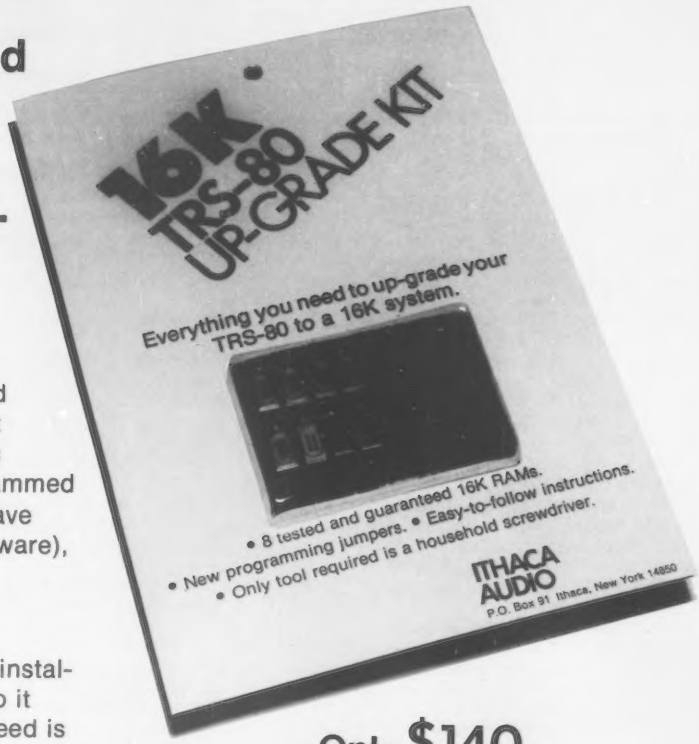
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CIRCLE 114 ON READER SERVICE CARD

The 6800 Microprocessor, Lance A Leventhal, Hayden Book Company, Rochelle Park, New Jersey. Softbound, 103 Pages, $5.95.

The 6800 is certainly one of the most popular microprocessors and many commercially made personal computers are built around it. This might indicate that 6800 assembly language programming is a desirable skill to acquire.

Lance Leventhal has written a self-study course with applications titled, "The 6800 Microprocessor." Except for a short discourse on CPU and PIA architecture and operation, the text concerns itself almost entirely with the 6800 instruction set and programs written in hex.

This is a practical application book but unless you have a Micro-68 computer it will not be too practical. All lessons are given as laboratory type exercises and they are keyed on the Micro-68 which is a KIM-like 6800 computer with a hex keyboard, six digit LED readout, onboard memory and PIA (Peripheral Interface Adapter).

The method of instruction is superb. Hands on application wins everytime. From a simple—LOAD, COMPLEMENT and DEPOSIT—to interrupts and peripherals, every lab lesson is an explain-program-perform cycle. The lab sessions are numbered, appropriately enough, from 0 to E in hex.

Forming arrays in memory, reading the keyboard and controlling the LED readout, designing and debugging programs, and doing arithmetic with the 6800 are some of the lab subjects. Using the subroutines contained in the monitor program also gets its share of discussion. Laboratory B extensively examines the PIA and how it is controlled with software, and Lab C concerns itself with the interrupt capabilities of the PIA.

Every page contains assembly language programming examples and explanations, and the author's grasp of the subject is obvious. A student or hobbyist who follows this court of instruction faithfully from beginning to end can't help but come away a better 6800 programmer.

However, as I've said, the entire workbook is geared to the Micro-68 and I feel that it is geared to that machine so closely that it would be of doubtful use to the owner of almost any other 6800 based computer. For instance, trying to correlate the instructional material to a machine with a Teletype or ASCII keyboard-CRT I/O would be difficult, if not impossible.

The ideal situation would be in a classroom where the students had access to one or more Micro-68s. An alternative would be to pack a copy of this book with each Micro-68 that is sold. Another book by Leventhal, "6800 Assembly Language Programming" (Osborne & Associates) is a much better choice for most would-be 6800 assembly language programmers. ■

Personal Computing: a Beginner's Guide, David Bunnell, Hawthorn Books, Inc., 260 Madison Avenue, New York, NY 10016. Hardbound, 208 Pages, $11.95.

The interest in personal computing is increasing at an astonishing rate and following along behind this interest has been a flood of books intended to introduce the beginner to this fascinating field. I have reviewed many of these books, some good ones and some bad ones. Most of the bad ones appear to have been rushed to the marketplace to take advantage of the demand for basic literature about computers.

On the other hand, "Personal Computing: a Beginner's Guide" is one of the best introductory texts that I've seen. The author, David Bunnell, who was a technical writer with MITS when the Altair was born, is a very knowledgeable gentleman. His narration of the physical, emotional and financial condition of MITS at the time of the Altair unveiling is very revealing. He is also the founding publisher of *Personal Computing* magazine.

The first thing that you notice in leafing through this book is the large number of pictures. Granted, they are commercial publicity pictures but they serve the purpose of illustrating the text quite well. You always know what the author is talking about.

After a brief discussion of the history of personal computing and a look at a typical microcomputer in action, the subject of applications is addressed. Not just a short list but page after page of detailed description. No actual programs are given but the reader will have a much better idea of what can be done when he finishes this chapter.

Next we look at the inside of a microcomputer and see what is going on. This is not an engineering level evaluation but an overview intended to give the novice a little background. Programming is handled in the same way. You won't emerge from these three chapters a hardware troubleshooter or an effective programmer but I think that this is really meant to get you interested enough to go looking for more.

Probably the most important part of this book, from the beginner's point of view, is the buyer's guide. Two chapters, about fifty pages, are devoted to describing and evaluating the major brands of microcomputers and the peripherals that go along with them. The Altair, the SOL and the TRS-80 are included. So are the PET, the Apple and many others. Both the pros and cons of various systems are discussed. Bunnell doesn't pull any punches here and I like that. It is too easy to pretend that everything is peaches and cream when it isn't. He also indicates how much it is going to cost to accomplish various tasks using different computers as models. This is something that is often overlooked in sales brochures.

The final chapter, titled "The Personal Computing Scene," is a discussion of computer clubs, stores, magazines and shows. Magazines are particularly important because I would guess that hobbyists get most of their information from them. Each magazine has what authors call a slant and this describes the type of material the editor usually prints. Some like simple stuff, others like it more difficult, some lean toward software and others lean toward hardware. Bunnell tells you what to expect from all of the major publications. Then he closes his book with a brief look into the future of personal computing.

The last fifty pages comprise a series of appendices. These list the names and addresses of 200 clubs, 500 stores and 136 manufacturers. My only real complaint about the book deals with these appendices. Given the turmoil and rapid change we are now experiencing, much of this information will quickly become obsolete. This book was published in September 1978 and already there are some incorrect listings.

The same remarks could also be directed toward the review of equipment in the Buyer's Guide sections but I feel that this will still be valuable information for some time to come. Especially since much of this equipment will show up sooner or later in "For Sale or Trade" ads as advanced hobbyists move up to more sophisticated computers and peripherals.

The information in this book is very basic and is intended for the person with little or no exposure to personal computers. Anyone who has been reading computer magazines for three to six months will have picked up most of this along the way.

The copy that I received is hardbound and housed in a very attractive jacket. If libraries were to buy and display "Personal Computing: a Beginner's Guide," I'm sure many people would pick it up and read it. If they did, they'd be hooked. In fact, as soon as my son is finished with it, I intend to donate my copy to the local high school. I think it would be a fantastic idea for all of us to donate our outgrown or otherwise surplus computer books to a library, school or potential hobbyist.

Since we are all bargain conscious in these inflationary times, I might suggest that the publisher consider a softbound edition that would sell at a lower price and reach a wider market. Hard cover books are fine, in fact probably necessary for lending libraries, but paperback books stand up well enough in personal usage.

I am happy to recommend this book with one qualification. It will only be of benefit to those with very little previous knowledge of personal computing. It would make a wonderful gift for that son, daughter or friend who you would like to get started. Or, buy one and give it to your local library. ■

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CIRCLE 141 ON READER SERVICE CARD

Here Cum da Software!

We evaluate the personal computing software from four companies and conclude that caveat emptor should be your guide.

Steve North

Over the past year or so, companies selling software have sprung up like proverbial mushrooms, forming a whole little industry of its own, just like the hardware people were doing in their garages and basements not too long ago. No doubt most of these organizations consist of one or two computer professionals working in their spare time, but there are also some established personal computer software houses, too. Over the past few months we've accumulated quite a few software packages on cassettes, so we thought it would be fun and useful to present some short reviews.

Apple II Software

MUSE, for Micro User's Software Exchange (13365 Baltimore, MD 21203) isn't much of an exchange, but does have some very high quality Apple software. Generally just one program per cassette, for something around $15, depending on the particular program.

Tankwar is a modification of the popular arcade game, in high resolution graphics. Each player controls his tank with a game paddle and pushbutton. The game paddle works like a steering wheel, so unless you consciously straighten out, your tank just goes in circles. The pushbutton is a firing control. The first player to accumulate 100 damage points loses. A temperature rating for each tank increases with repeated firing and when it reaches sufficiently high levels, prevents firing completely. Options selected at the start of the game include tank shape, size, and color. Tankwar is not as similar to the arcade version of the game as you might think, because the controls react much differently and the tanks are apparently self-healing at an alarmingly fast rate! Fun, though, once you get the hang of it.

The Music Box is a simple Apple music composition and playback system. The Apple's built-in speaker was intended for miscellaneous beeps and buzzes, and not music synthesis, but the Music Box works well within these limitations, with one voice and a three-octave range. The music composition language is thus very straightforward but likewise very limited. Music compositions may be saved and loaded on cassette tape (two demos are included). A "kaleidescope" display flickers in time with the music as it's played. (However, it is not really fair to call a random display of boxes on the screen a kaleidescope. A kaleidescope should be symmetric, at the very least.) Music Box is fine for hacking around, but if you're really serious about computer music, then more hardware is required. (We'd heard that ALF is coming out with an Apple version of their music board which can provide much better synthesized music, but they will not be developing much software.) A fun way to play with your Apple, at least.

The Maze Game is certainly one of the best Apple programs we've ever tried. Probably almost everyone has seen a BASIC program that prints mazes, which you then solve with a pencil. The Maze Game literally adds another dimension to this idea. Instead of the usual static bird's-eye view, you see a perspective view of the inside of the maze, which changes gradually as you walk forward, to show approaching walls and turnoffs, all in living color on your TV screen. Your game paddle allows you to control the direction taken at intersections while pressing the game button effects a 180° turn (handy at dead-ends). Game options allow you to select the size of the maze, whether you leave footsteps (which help if you need to backtrack) and a display of the bird's-eye view when you type M, if you need to cheat a little. This is quite an enjoyable and imaginative game, and we highly recommend it.

Escape is unfortunately mostly a tear-off of the Maze Game. This concept here is that you're trying to escape from a very large maze, and as you wander about, you meet odd faceless people who can answer any of three questions: "Do you tell the truth?" (yes or no), "Which direction am I going?" (a compass heading), and "Do you have anything to give me?" (a map, compass, pass, etc.) Another type of faceless people are apparently police, who will confiscate your pass if you have one, or haul you off to the slammer if you don't have one, so they're definitely to be avoided. The keyboard, instead of a game paddle, controls your direction of movement. Other than this, Escape is *very* similar to the Maze Game. Also, the maze is so large that the game can get rather tedious, as demonstrated by the addition of commands to load and save the current game on tape. If MUSE wants to do more games using 3-D graphics, they should come up with something more imaginative than a slight modification of another game.

Sideshow contains six short games on a single tape. **Apple Tree** is a two-player game, in which you try to position your basket to catch apples which fall out of a tree at random, using a game paddle. Nice idea. **Safecracker** is for two players, who compete to open the safe first by cracking the secret combination. The game paddles are manipulated like safe dials, except that the position of each "dial" is indicated numerically on the screen. In order to crack the safe, you must turn in one direction to the correct number, then in the opposite direction, etc. The **Pip Shoot** is for one or two players (in cooperation). The object of the game is to line up a moving target in the crosshairs and to hit it by pushing either game button. **Minelayer** and **Blockade** are similar games, except that in Minelayer you can selectively turn your trail on or off, and must use the non-continuous game paddle for direction control (tricky!) while Blockade is the standard game, with keyboard input. **Quadripong** is a derivative of PONG. Each player controls two paddles, on opposite sides of

the screen, and there are no walls. As in regular PONG, you try to keep hitting the ball until one or the other player misses. We decided that one player has a definite advantage over the other, because of the nature of the Apple's graphics which make the angles much more acute on one side than the other. Note that all the games on this tape are of the manual-dexterity type (no real thinking involved.). OK if you you're looking for video games.

● ● ● ●

Speakeasy Software also has a number of nicely done Apple packages, but they don't incorporate any graphics. But since people and computers have been getting along without color graphics for quite a while now, and it's rather senseless to introduce color graphics for no useful reason, this is nothing to hold against them. On to the reviews...

Bulls and Bears is a competitive version of Stock Market, an olde computer game. Each player begins with $50,000 and may buy or sell shares in several different companies, borrow from the bank, etc. The player with a controlling interest in a company serves as its director, deciding on dividends, buying and selling "production units", taking out and repaying bank loans, etc. Rather than relying on random factors, the value of a company's stock depends on realistic factors, such as production, profits, solvency, etc. In our play of the game, we ended up with a bunch of very used-up, wasted companies and over $6 million each. This was done by having each company borrow like crazy at really usurious interest rates (10-20%, though really that isn't *too* inaccurate these days), which caused stock prices to start fluctuating wildly. Of course, you can use the traditional methods of slowly developing production, taking out small loans, etc., but this takes a long time. All the game needs now is some version of the SEC to prevent such outright fraud. We really enjoyed it and would highly recommend it, although for truly educational purposes it probably needs the modifications mentioned.

Microtrivia is a computerized trivia quiz game, with about ten questions each in twelve areas, such as "Famous Animals" or "Crime and Criminals." Questions are true-false, multiple-choice, and matching. Fun at first - but once you've done all the questions, it loses interest. However, it's probably great for showing off your computer to a friend. The manual curiously points out that neither President Carter nor Bobby Orr has played Microtrivia, but they probably don't have computers, either.

Kidstuff, appropriately enough, is a package of short games and activities designed for both the amusement and education of your kids, ages 7 to 11. They generally involve word spelling, pronunciation, and meanings. Not being between 7 and 11, it's hard to be definite, but some members of the *Creative Computing* staff thought that "Ralph the Computer's" penguin joke was pretty strange. (We'll try to get some kids to try this out).

PET Software

Kilobaud magazine has also recently entered the software market with PET and TRS-80 programs. We had a chance to checkout four of their PET programs.

Casino I contains blackjack and roulette on one tape. Both programs incorporate fairly slick graphics, but unfortunately instructions are included in a program on the tape rather than in a printed booklet. This means you have to memorize them before running the actual game. It's also a little ironic that instructions on how to load and run a program are given in such a way that you must load and run a program to get them. The games themselves are OK if you like computer gambling games (I don't).

Casino II is a craps program. Not being into this kind of thing, I did not understand the game and the references to the non-existent instruction booklet were not much help either. Again, fairly slick graphics and probably a nice program for some people.

Personal Weight Control and **Biorythms** *does* include an instruction booklet, but very strangely it has a picture of a TRS-80 screen on the cover! Most of the booklet consists of a source program listing, unnecessary since you obviously bought the cassette so you wouldn't have to type the whole thing into a computer, and also not very helpful if there are typographical errors. The Weight Control program accepts data on your height, build, etc. and then computes a suggested weight and can also plan a diet (calories/day) if you want. Biorythms is typical although the graphics are used well. There are a few strange things about the package, like the menu which asks you to select number 1, 2, 3, or 4, and the instructions in the booklet tell you to make sure the cable connections to the computer were secure (the PET does not have cable connections - the cassette unit is built-in). At least Personal Weight Control may be worth it as a "serious" application.

Mortgage with Prepayment and Financier are financial calculation programs. The Mortgage program allows you to enter principal amount, term, interest rate, and number of payments per year, and spits back the amount of each payment and the cost of the mortgage, and also lets you see how this is affected by prepayment. Financier does calculations on investments, depreciation, and loans, with various options. In summary, worthwhile if you need these kind of calculations.

Postscript

Since home computer software is an entirely new market, absolutely everyone (including **Creative Computing**) is still feeling his way. As to slickness and professional touches, very few home computer software packages can hold a candle to the video arcade games or the kind you plug into your home teevee. Rough edges abound, in the form of spelling errors, missing punctuation, not checking for bad input, not initializing graphics mode, and even programming bugs. Packaging is generally the pits - only MUSE did a really admirable job. Documentation is spotty. This is definitely still a cottage industry.

In the next issue (hopefully) we'll take a look at some more software, including Connecticut Microcomputer's PET text editor, and software from Softside Software and Program Design, Inc.

HOME

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Roger O. Littge, MD

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Who Really Needs Interfacing Problems?

Interfacing things to computers has sometimes been a real bugaboo even for experienced engineers. Here's a sad, but true, tale of a newcomer's experience in this area.

Donald E. Skiff

I bought my Heathkit H8 computer last winter, while I was working for someone else, and planned to experiment with it, more than try to make it productive. Yes, there were technical programs I wanted to develop, and I wanted to use it to control things, such as audio-visual equipment. But mainly I was just fascinated with the new "toy." I bought the Heath because I've built scores of Heathkits over the past twenty years, and I trusted them to lead me through anything I didn't know. And, I didn't know plenty.

Several months ago I decided to become a free-lance writer. I had used the text editor in my computer before, but didn't have a printer. Since I had to buy a typewriter for my new trade anyway, I might as well combine my interest in computers with making my living. So I borrowed the money to buy a modified Selectric, and hooked it up. Easy, right? Wrong. The store where I bought the typewriter raised an eyebrow when I told them about the Heathkit. They as much as told me, "You're on your own. We don't know anything about hooking this up to a Heathkit." I smiled, knowingly. Naturally, they want to sell their own computers. So I insisted on copies of circuit diagrams and any other technical data they might have.

I'm one of those people who don't know they don't know. I connected the machines together the way I interpreted the diagrams and, of course, nothing happened. After a couple of days of cussing and trying, I called Benton Harbor. "I'm not familiar with that printer, and I really don't know what to suggest. What you've tried sounds as if it should work, though." They really were sympathetic, but as the store said, I was on my own.

I found a couple wires in a plug that might have been touching, and I tried positive and negative strobe and ready connections, and finally got the system "Up And Running!" Hurray!

People who make terminals that print only capital letters don't make a big thing in their literature about that fact. You have to know enough to ask. Well, when I had bought my Heath system, lower case was not important to me, either. However, a writer who submits all-caps manuscripts is just asking for rejection slips. Naturally, my $550 Heath terminal would not make lower case letters, even with a different keyboard attached (I tried that, too, for another $85). Benton Harbor told me there's no way to modify it, either. So, my investment grew. The typewriter cost me $1800, plus another $200 for the interface board. I already had $1600 in the H8 and H9, and the time had come for another kilobuck. The market for already-built Heathkits isn't great, which I guess I understand. Quality control in assembly is an individual thing.

In the meantime, however, my printer, which had been pounding out all-caps letters, forms and programs like crazy for a month or so, stopped. The store checked out the Selectric and their part of the interface, and reported "no problems." The local Heath store looked at the interface board, replaced a UART, and gave it back. "No problem." It ran for two hours, then quit again.

The day I brought my new Hazeltine terminal home, the computer was in the shop for a week. They sent it back with a new memory chip and a bus driver. "No problem."

RS-232 is standard, right? You got it. When the terminal didn't work with the H8, I called Heath again. (I'm taking blood pressure pills by now.) They told me (right off) to bypass the optical isolator on the serial interface board. That worked, although I still don't know why, and at this point I don't ask.

Mind you, all this time I'm trying to make a living writing technical manuals, pounding away at 15 or so words per minute manually on two thousand dollars worth of typewriter. I'm losing days at a time running back and forth trying to get the system into operation. "Don't worry," I'm telling my Loved One, "when I do get this thing running, I can write circles around my competition."

The computer came back and ran (with the new terminal and the new typewriter) for six hours. The next morning, together with my whole system I invaded the Heath store. The technician really tried. "The computer is working, according to our test routines. There must be something wrong with the typewriter system." We went over all the literature, diagrams, manuals and experience and came up with a blank. When I left the store, I had a fantasy of lifting the computer high over my head and smashing it into the parking lot, then running off down the street, laughing wildly. Instead I took another pill and drove the typewriter controller down to the other store. "Please check it again, will you?" It occurred to me to offer him ten bucks to find something wrong.

The three days the controller was gone, I went over and over the Heath literature trying to find a clue to the problem. At one point I was so confident I input several pages of manuscript (the terminal was working fine) and stored it on tape, to be printed out "when the controller is fixed." At another point I was so discouraged I went out shopping for a new computer. Let's see...$1600, plus $2000, plus $1300 for the new terminal, plus... To get simply a replacement computer, with only the peripherals necessary to run my terminal, two cassettes and the printer, will cost me somewhere between $1400 and $2200. If I get the cheapie (one of the in-house assemblies of available boards and box, being offered by one of the local computer stores) I will have spent $6300 for a typewriter that forgives my mistakes.

"You could have hired a part-time typist, for that," my Loved One reminds me. But she admires my persistence. It's the cussing she complains of. Right now I'm sitting here at the Hazeltine, inputing this as though I know that when I turn on the Selectric, it will begin chattering away... ■

Donald E. Skiff, 2448 Vera Ave., Cincinnati, OH 45237.

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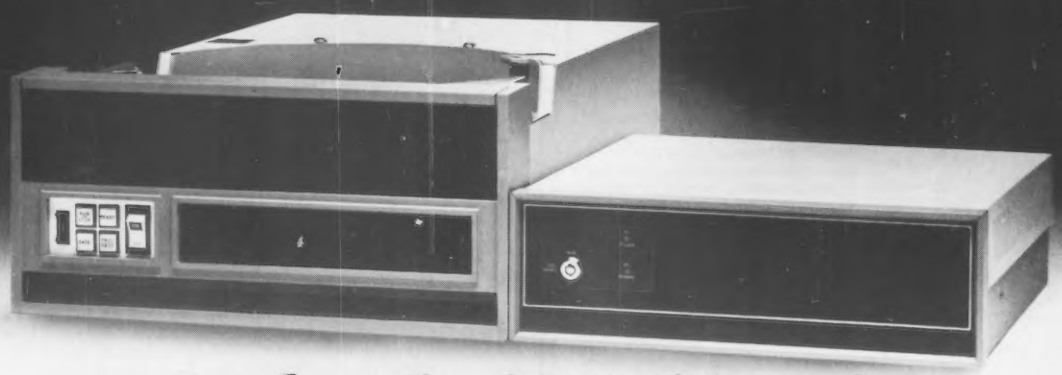

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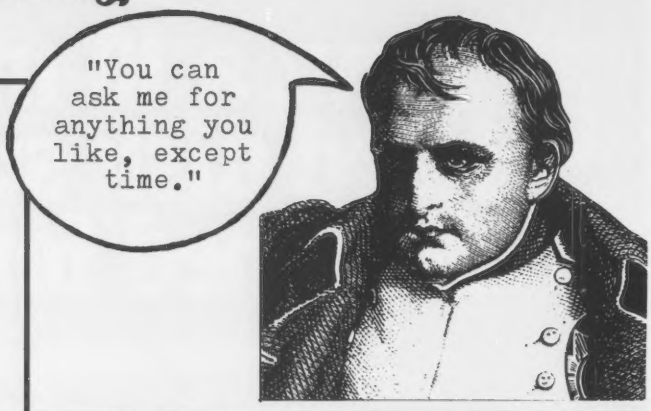

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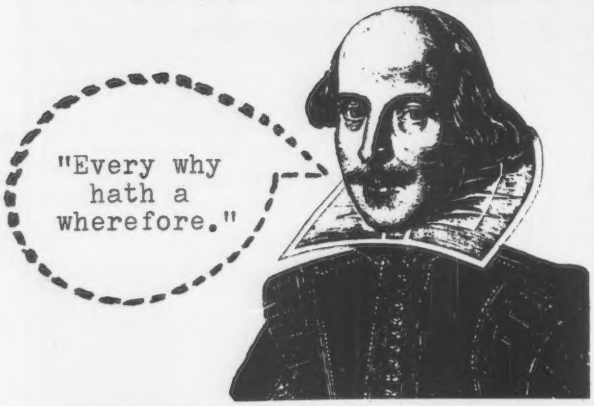

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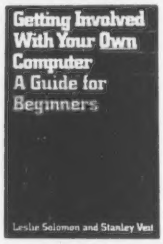

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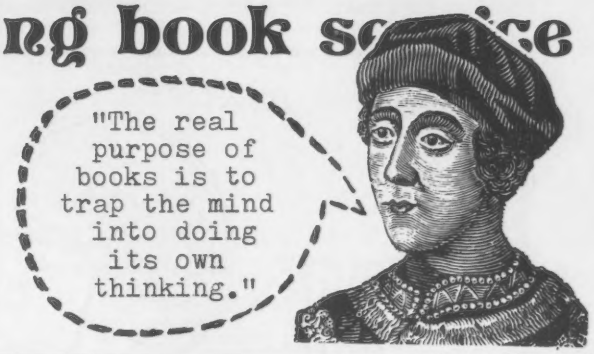

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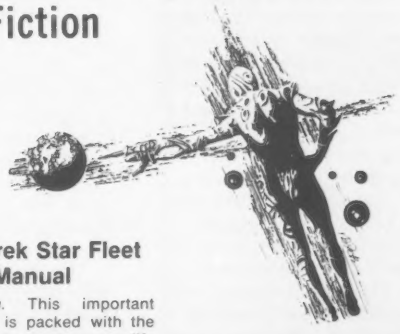

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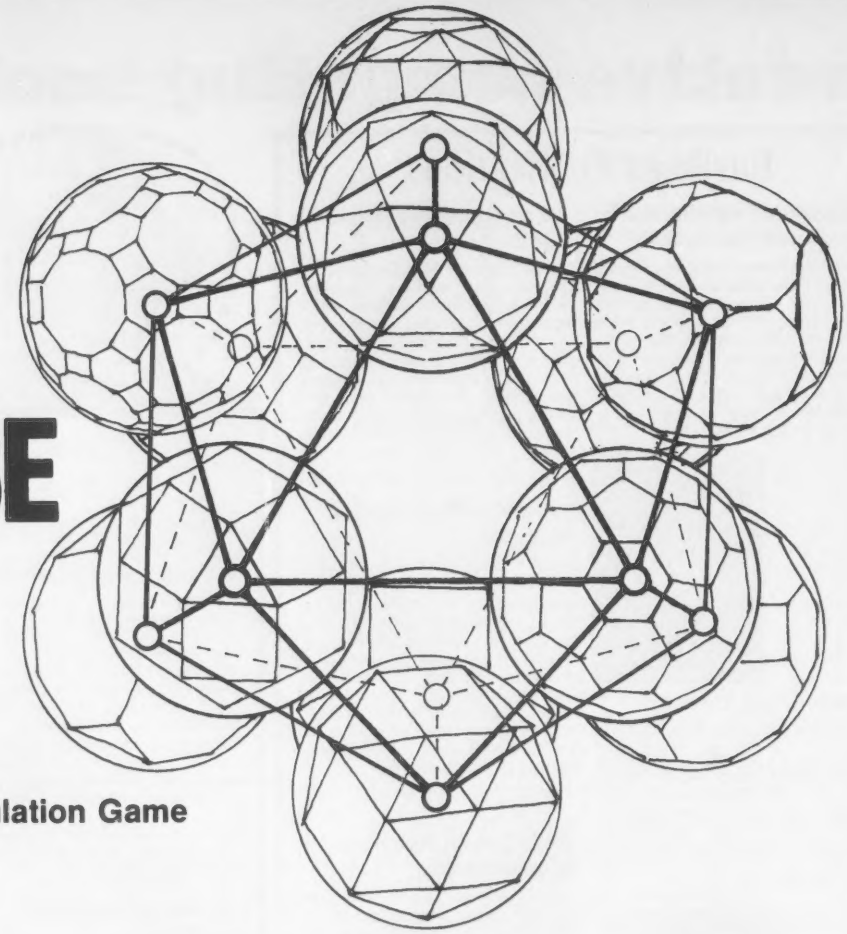
SPACE MAZE



3D Space Simulation Game

Lloyd Johnson

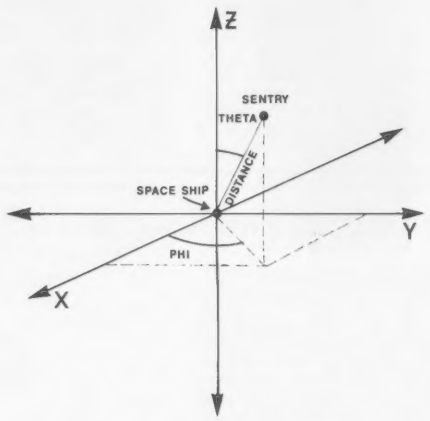
Space Maze is a three dimensional maze game written in BASIC/RT-11. The game consists of maneuvering a space ship past ten robot sentries toward a space station. If you come within 1000 km of the sentries they destroy you and you lose the game. Neither the space station nor the sentries move. A more detailed description of how the game is played may be found in lines 150-350 of the program.

Spherical coordinates were chosen for the printout since distance is one of the parameters. All coordinates in the printout are referenced to your space ship which is always located at the origin. When your space ship moves the coordinate system moves with you. The following figure illustrates how spherical coordinates are used to define the position of a robot sentry.

Theta can vary from 0 to 180 degrees while phi can vary from 0 to 360 degrees. By using these two angles along with the distance from the origin, the position of any point in three dimensional space can be uniquely defined.

As the space ship moves, the new position of the sentries and space station in reference to the space ship is updated on half minute intervals. The program keeps track of everyone by referencing the space ship and sentries to the station and translating to the other reference system for the printout. Translation between reference systems was easily accomplished in rectangular coordinates. This required subroutines to convert from spherical coordinates to rectangular coordinates and vice versa. These subroutines may be found at lines 880 and 1900.

Lloyd Johnson, 3872 Ballatine Rd., Eagen, Minnesota 55122



The initial position of the sentries is selected randomly with positions less than 500 km or greater than 1750 km from the station thrown out and reselected. The game may be made easier by increasing the maximum distance from the station to 2000 km. This is done by setting "A" equal to 2000 at line 680 in the program. If "A" is reduced to 1500 the sentries are packed closer together and it is more difficult to find a path through them.

An explanation of the strategy employed in the sample run is as follows:

SHIP TIME: 0 MINUTES The nearest sentry is over 2300 km away. I can easily risk going 1300 km straight at the station since the sentries can't harm me until I am within 1000 km of them.

SHIP TIME: 13 MINUTES There is a 60 degree variation between the station's phi angle and sentry #4's phi angle as well as a 32 degree variation in their theta angles. I will risk going 500 km straight at the station since it is quite unlikely this maneuver will bring me 358 km closer to sentry #4 which would be fatal.

SHIP TIME: 18 MINUTES Sentry #1 is now very close. I can increase the distance to #1 and decrease the distance to the station by staying on the X-Y plane (theta = 90) and moving at right angles to #1 with respect to the phi angle. This is done by typing in a phi angle 90 degrees less than the phi angle for sentry #1.

SHIP TIME: 19 MINUTES Although the last maneuver achieved its objective, it also moved me closer to sentry #4. Since everyone is above the X-Y plane (theta 90), I can increase everyones distance by going straight down (theta = 180).

SHIP TIME: 22 MINUTES By using a strategy similiar to that used at SHIP TIME: 18 MINUTES, the distance to sentry #4 may be increased while simultaneously decreasing the distance to the station.

SHIP TIME: 25 MINUTES This maneuver will direct my ship straight at the station for 3 minutes or 300 km.

SHIP TIME: 28 MINUTES Sentry #1 is dangerously close! Again I will employ the strategy used at SHIP TIME: 18 MINUTES.

SHIP TIME: 31 MINUTES I have reached the point where the station is almost directly overhead. By decreasing the theta angle to 70 degrees my spaceship will start to angle upward. I used the phi angle of the station since it will move me away from sentry #1 as well as move me toward the station.

SHIP TIME: ? MINUTES I blew it! I wasn't watching sentry #9 at all. By typing in a shorter time interval I probably would have been able to maneuver around him.

I am currently working on a variation to this program where the sentries will move in random orbits around the station. I also have another version of this program in which the sentries are enemy space ships and are programmed to move toward you and attack. Anyone interested in a listing of this program can write to me at the address listed in lines 30-50 of the Space Maze program and I will do my best to accommodate. ■

```
                SPACE MAZE

DO YOU WANT INSTRUCTIONS (Y/N)?N
ENTER A NUMBER BETWEEN 1 AND 500 TO BEGIN THE MISSION?100

SENTRY          DISTANCE        PHI             THETA
 1               2822.2          11.1327         30.2087
 4               2370.99         319.17          46.1714
STATION          3392.43         358.794         33.7077
SHIP TIME:  0  MINUTES
ENTER VELOCITY, PHI AND THETA COORDINATES AND TIME INTERVAL.
?100,358.33,13

SENTRY          DISTANCE        PHI             THETA
 1               1542.2          23.5527         29.0132
 2               2471.32         41.4369         31.9313
 3               2445.63         334.802         72.9045
 4               1358.11         298.209         66.0344
 6               2266.27         35.1123         67.6532
 7               2090.68         19.5871         56.135
 9               2038.01         16.2939         51.7482
 10              2084.96         307.736         41.4986
STATION          2092.66         359.273         34.1499
SHIP TIME:  13  MINUTES
ENTER VELOCITY, PHI AND THETA COORDINATES AND TIME INTERVAL.
?100,359.34,5

SENTRY          DISTANCE        PHI             THETA
 1               1062.94         36.7958         28.498
 2               2019.71         51.1628         33.5696
 3               2107.79         331.652         81.6962
 4               1139.5          285.751         83.0882
 5               2675.39         303.039         7.45022
 6               1929.95         40.1477         76.6027
 7               1657.21         23.4024         63.0726
 8               2871.98         337.491         53.1166
 9               1582.06         19.8606         57.6199
 10              1679            297.49          46.9076
STATION          1592.66         359.358         34.1971
SHIP TIME:  18  MINUTES
ENTER VELOCITY, PHI AND THETA COORDINATES AND TIME INTERVAL.
?100,305.90,1

SENTRY          DISTANCE        PHI             THETA
 1               1069.12         47.8781         29.1023
 2               2037.5          55.9593         34.3161
 3               2019.89         332.94          81.3321
 4               1046.36         283.929         82.4695
 5               2664.27         302.246         5.31916
 6               1941.24         43.17           76.683
 7               1642.23         27.2476         62.807
 8               2805.49         338.881         52.0906
 9               1563.05         24.0751         57.1769
 10              1608.08         296.825         44.4955
STATION          1562.77         4.90438         32.5492
SHIP TIME:  19  MINUTES
ENTER VELOCITY, PHI AND THETA COORDINATES AND TIME INTERVAL.
?100,0,180,3

SENTRY          DISTANCE        PHI             THETA
 1               1339.22         47.8782         22.8473
 2               2291.53         55.9594         30.0835
 3               2086.29         332.94          73.1596
 4               1125.68         283.929         67.1496
 5               2963.11         302.246         4.78131
 6               2031.43         43.17           68.4205
 7               1799.23         27.2476         54.278
 8               2999.17         338.881         47.5641
 9               1743.98         24.0751         48.8653
 10              1834.16         296.825         37.913
STATION          1822.81         4.90439         27.469
SHIP TIME:  22  MINUTES
ENTER VELOCITY, PHI AND THETA COORDINATES AND TIME INTERVAL.
?100,10,90,3

SENTRY          DISTANCE        PHI             THETA
 1               1279.55         80.9192         15.3086
 2               2204.99         68.8791         25.9398
 3               1867.22         327.066         71.1134
 4               1146.52         267.527         67.5877
 5               2968.83         237.909         5.95594
 6               1807.75         48.8925         65.5878
 7               1578.04         31.5797         48.2646
 8               2819.22         334.351         44.1241
 9               1538.52         28.1563         41.7821
 10              1805.11         281.392         36.7127
STATION          1705.91         2.08988         18.5478
SHIP TIME:  25  MINUTES
ENTER VELOCITY, PHI AND THETA COORDINATES AND TIME INTERVAL.
?100,0,18,3

SENTRY          DISTANCE        PHI             THETA
 1               1006.53         96.7336         19.4951
 2               1938.06         74.1852         28.8491
 3               1719.51         325.356         79.3055
 4               1078.67         262.552         81.9093
 5               2692.45         225.512         7.80924
 6               1652.56         51.4156         73.772
 7               1339.68         34.11           55.1692
 8               2560.3          333.128         47.2354
 9               1278.59         30.8113         47.6139
 10              1575.81         276.496         42.5038
STATION          1405.95         2.52031         18.6676
SHIP TIME:  28  MINUTES
ENTER VELOCITY, PHI AND THETA COORDINATES AND TIME INTERVAL.
?100,0,90,3

SENTRY          DISTANCE        PHI             THETA
 1               1061.48         135.493         26.636
 2               1921.76         92.8728         27.9543
 3               1487.5          318.615         77.6128
 4               1156.11         247.509         82.4545
 5               2737.36         205.131         12.9735
 6               1492.38         60.9273         71.9736
 7               1156.92         45.2891         48.5945
 8               2374.69         328.319         42.9406
 9               1112.72         43.424          39.2297
 10              1581.42         260.367         42.7253
STATION          1340.5          7.53621         6.46268
SHIP TIME:  31  MINUTES
ENTER VELOCITY, PHI AND THETA COORDINATES AND TIME INTERVAL.
?100,7,70,2
SENTRY 9 HAS TOTALLY DESTROYED YOUR SHIP.
```

```
10 REM: SPACE MAZE
20 REM:
30 REM:    LLOYD JOHNSON
40 REM:    3872 BALLANTRAE ROAD, APARTMENT A
50 REM:    EAGEN, MINNESOTA   55122
60 REM:
70 PRINT "            SPACE MAZE"
80 PRINT
90 PRINT "DO YOU WANT INSTRUCTIONS (Y/N)";
100 INPUT A$
110 IF A$="Y" THEN 140
120 IF A$="N" THEN 360
130 GO TO 90
140 PRINT
150 PRINT "YOU ARE IN COMMAND OF A SPACESHIP ON AN ARCHAEOLOGICAL "
160 PRINT "EXPEDITION WHICH WAS ASSIGNED TO MANEUVER WITHIN 500 KM OF AN"
170 PRINT "ABANDONED ALIEN SPACE STATION TO PICK UP ANCIENT ARTIFACTS. "
180 PRINT "THIS SHOULD BE DONE IN THE LEAST AMOUNT OF TIME TO MINIMIZE THE"
190 PRINT "THE INSTITUTE OF ARCHAEOLOGY'S EXPENSES. "
200 PRINT
210 PRINT "DANGERS INCLUDE TEN ROBOT SENTRIES SITTING STATIONARY IN SPACE"
220 PRINT "AROUND THE STATION.  THESE SENTRIES WILL AUTOMATICALLY DESTROY"
230 PRINT "YOUR SHIP IF YOU COME WITHIN 1000 KM OF THEM. "
240 PRINT
250 PRINT "YOUR MAXIMUM VELOCITY IS LIMITED TO 100 KM/MIN.  THIS"
260 PRINT "ENABLES YOU TO CHANGE YOUR COURSE TO ANY DIRECTION REGARDLESS"
270 PRINT "OF YOUR PREVIOUS VELOCITY AND COURSE. "
280 PRINT
290 PRINT "THE SCREEN WILL DISPLAY THE DISTANCE AND COORDINATES OF THE"
300 PRINT "SENTRIES AND STATION IN SPHERICAL COORDINATES REFERENCED TO"
310 PRINT "YOUR SHIP.  ONLY SENTRIES WITHIN 3000 KM WILL BE DISPLAYED"
320 PRINT "SINCE THE SCANNER RANGE IS LIMITED.  THETA VARIES FROM 0 TO"
330 PRINT "180 DEGREES AND IS MEASURED FROM THE Z AXIS.  PHI VARIES FROM"
340 PRINT "0 TO 360 DEGREES AND IS MEASURED FROM THE X AXIS. "
350 PRINT
360 PRINT "ENTER A NUMBER BETWEEN 1 AND 500 TO BEGIN THE MISSION";
370 T4=0
380 F=0
390 DIM X(24),Y(24),Z(24),R(24),P(24),T(24)
400 REM: ODD COORDINATES 3,5,7...21 ARE SENTRIES REFERENCED TO THE STATION
410 REM: EVEN COORDINATES 2,4,6...20 ARE SENTRIES REFERENCED TO THE SHIP
420 REM: COORDINATES SUBSCRIBTED BY 1 IS SHIP REFERENCED TO STATION
430 REM: COORDINATES SUBSCRIPTED BY 23 IS STATION REFERENCED TO SHIP
440 REM: COORDINATES SUBSCRIPTED BY 24 IS VELOCITY VECTOR
450 INPUT T
460 FOR I=1 TO T
470 X=RND(I)
480 NEXT I
490 DEF FNA(X)=RND(X)*10000-5*1000
500 DEF FNB(X)=X*180/3.14159
510 DEF FNC(X)=X*3.14159/180
520 DEF FND(X)=3.14159/2-ATN(X/SQR(1-X^2))
530 DEF FNE(I)=SQR(X(I)^2+Y(I)^2+Z(I)^2)
540 GOSUB 590 \REM: INITIALIZE ALL POSITIONS
550 GOSUB 810 \REM: SCAN
560 GOSUB 1300 \REM: INPUT VELOCITY AND MOVE SHIP
570 GO TO 550
580 REM:
590 REM: INITIALIZE POSITIONS
600 REM:
610 X(1)=FNA(X(1))
620 Y(1)=FNA(Y(1))
630 Z(1)=FNA(Z(1))
640 FOR I=3 TO 21 STEP 2
650 X(I)=FNA(X(I))/3
660 Y(I)=FNA(Y(I))/3
670 Z(I)=FNA(Z(I))/3
680 A=1750
690 REM: A DEFINES THE MAXIMUM DISTANCE THE SENTRIES CAN BE FROM
700 REM: THE STATION.  DECREASE A TO 1500 FOR A MORE
710 REM: CHALLENGING GAME.
720 IF FNE(I)<=500 THEN 650
730 IF FNE(I)>=A THEN 650
740 GOSUB 1820 \REM: REFERENCE POSITION OF SENTRIES TO SHIP
750 NEXT I
760 FOR I=2 TO 20 STEP 2
770 GOSUB 1550 \REM: CONVERT FROM RECTANGULAR TO SPHERICAL COORDINATES
780 NEXT I
790 RETURN
800 REM:
810 REM: SCAN
820 REM:
830 REM: REFERENCE STATION TO SHIP
840 X(23)=-X(1)
850 Y(23)=-Y(1)
860 Z(23)=-Z(1)
870 I=23
880 GOSUB 1550 \REM: CONVERT FROM RECTANGULAR TO SPHERICAL COORDINATES
890 PRINT
900 PRINT "SENTRY","DISTANCE","PHI","THETA"
910 FOR I=2 TO 20 STEP 2
920 GOSUB 1550 \REM: CONVERT FROM RECTANGULAR TO SPHERICAL COORDINATES
930 IF R(I)>3000 THEN 950
940 PRINT I/2,R(I),P(I),T(I)
950 NEXT I
960 PRINT "STATION",R(23),P(23),T(23)
970 PRINT "SHIP TIME: ";T4;" MINUTES"
980 IF F=1 THEN 1060
990 IF R(23)>500 THEN 1280
1000 PRINT
1010 PRINT "CONGRATULATIONS YOU ARE NOW ABLE TO COLLECT THE ARTIFACTS. "
1020 PRINT "THE NEXT PROBLEM IS TO GET AT LEAST 5000 KM FROM THE STATION"
1030 PRINT "SO YOU CAN WARP OUT. "
1040 F=1
1050 GO TO 1280
1060 IF R(23)<5000 THEN 1280
1070 IF T4>100 THEN 1120
1080 PRINT
1090 PRINT "CONGRATULATIONS YOU HAVE COMPLETED THE MISSION IN RECORD TIME. "
1100 PRINT "YOU ARE A SUPERB PILOT. "
1110 GO TO 2010
1120 IF T4>150 THEN 1170
1130 PRINT
1140 PRINT "CONGRATULATIONS YOU MADE IT IN GREAT TIME. "
1150 PRINT "YOU ARE A GOOD PILOT. "
1160 GO TO 2010
1170 IF T4>200 THEN 1220
1180 PRINT
1190 PRINT "IT TOOK YOU A WHILE BUT YOU MADE IT OUT OF THERE ALIVE"
1200 PRINT " WITH THE ALIEN ARTIFACTS.  GOOD WORK. "
1210 GO TO 2010
1220 PRINT
1230 PRINT "YOU FINALLY MADE IT. "
1240 PRINT "THE INSTITUTE HAD GIVEN YOU UP FOR LOST SINCE IT TOOK"
1250 PRINT "YOU SO LONG. "
1260 PRINT "YOUR NAVIGATIONAL SKILLS COULD USE SOME PRATICE. "
1270 GO TO 2010
1280 RETURN
1290 REM:
1300 REM: INPUT VELOCITY AND MOVE SHIP
1310 REM:
1320 PRINT "ENTER VELOCITY, PHI AND THETA COORDINATES AND TIME INTERVAL. "
1330 INPUT R(24),P(24),T(24),T1
1340 IF R(24)<=100 THEN 1370
1350 PRINT "MAXIMUM VELOCITY IS 100 KM/MIN. "
1360 GO TO 1320
1370 I=24
1380 GOSUB 1900 \REM: CONVERT FROM SPHERICAL TO RECTANGULAR COORDINATES
1390 T3=.5
1400 T2=0
1410 IF T3+T2<T1 THEN 1430
1420 T3=T1-T2
1430 X(1)=X(1)+X(24)*T3
1440 Y(1)=Y(1)+Y(24)*T3
1450 Z(1)=Z(1)+Z(24)*T3
1460 FOR I=3 TO 21 STEP 2
1470 GOSUB 1820 \REM: REFERENCE POSITION OF SENTRIES TO SHIP
1480 IF FNE(I-1)<=1000 THEN 2000
1490 NEXT I
1500 T2=T3+T2
1510 IF T2<T1 THEN 1410
1520 T4=T4+T2
1530 RETURN
1540 REM:
1550 REM: CONVERT FROM RECTANGULAR TO SPHERICAL COORDINATES
1560 REM:
1570 R(I)=FNE(I)
1580 IF X(I)<>0 THEN 1610
1590 P(I)=90
1600 GO TO 1650
1610 P(I)=ATN(Y(I)/X(I))
1620 P(I)=FNB(P(I))
1630 IF X(I)>0 THEN 1650
1640 P(I)=P(I)+180
1650 IF R(I)<>0 THEN 1680
1660 T(I)=0
1670 GO TO 1800
1680 IF ABS(Z(I)/R(I))<>1 THEN 1740
1690 IF Z(I)/R(I)>0 THEN 1720
1700 T(I)=180
1710 GO TO 1750
1720 T(I)=0
1730 GO TO 1750
1740 T(I)=FNB(FND(Z(I)/R(I)))
1750 IF P(I)<360 THEN 1770
1760 P(I)=P(I)-360
1770 IF P(I)>=0 THEN 1800
1780 P(I)=P(I)+360
1790 GO TO 1750
1800 RETURN
1810 REM:
1820 REM: REFERENCE POSITION OF SENTRIES TO SHIP
1830 REM:
1840 REM: I MUST ALWAYS BE ODD
1850 X(I-1)=X(I)-X(1)
1860 Y(I-1)=Y(I)-Y(1)
1870 Z(I-1)=Z(I)-Z(1)
1880 RETURN
1890 REM:
1900 REM: CONVERT FROM SPHERICAL TO RECTANGULAR COORDINATES
1910 REM:
1920 T(I)=FNC(T(I))
1930 P(I)=FNC(P(I))
1940 X(I)=R(I)*SIN(T(I))*COS(P(I))
1950 Y(I)=R(I)*SIN(T(I))*SIN(P(I))
1960 Z(I)=R(I)*COS(T(I))
1970 T(I)=FNB(T(I))
1980 P(I)=FNB(P(I))
1990 RETURN
2000 PRINT "SENTRY"(I-1)/2"HAS TOTALLY DESTROYED YOUR SHIP. "
2010 END
```

Answers to last months' puzzle

1 F	2 A	3 S	4 T	■	5 C	6 O	7 R	8 E	■	9 D	10 A	11 S	12 D
13 A	C	E	A	■	14 O	R	A	L	■	15 C	E	L	I	A
16 T	R	A	P	■	17 D	A	T	A	18 R	E	C	O	R	D
19 H	O	L	E	20 S	I	T	E	■	21 E	L	A	P	S	E
■	■	■	22 F	I	N	E	■	23 A	G	E	D	■	■	■
24 G	25 A	26 T	I	N	G	■	27 O	V	E	R	E	28 A	29 T	30 S
31 A	G	I	L	E	■	32 B	R	I	N	Y	■	33 D	E	Y
34 M	A	M	E	■	35 B	I	G	O	T	■	36 C	H	A	S
37 U	T	E	■	38 D	A	M	E	N	■	39 S	H	O	S	T
40 T	E	R	41 M	I	N	A	L	■	42 S	P	A	C	E	S
■	■	■	43 C	O	N	G	■	44 S	T	A	N	■	■	■
45 A	46 R	47 C	A	D	E	■	48 S	C	A	N	N	49 E	50 R	51 S
52 C	A	R	D	E	D	53 I	T	O	R	■	54 E	L	S	E
55 A	R	E	A	S	■	56 C	O	P	T	■	57 L	I	V	E
58 D	E	E	M	■	■	59 E	W	E	S	■	60 S	A	P	S

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Puzzles & Problems

Superprimes

Definition: A **SUPERPRIME** is an integer such that it is prime and every integer obtained by deleting a digit from the right is a prime. E.g., 7331 is prime, 733 is prime, 73 is prime, and 7 is prime. Thus 7331 is a superprime.

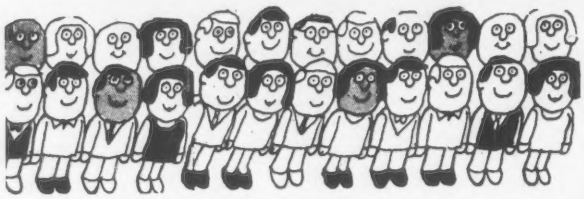
Problems:

a. How many 2- and 3-digit superprimes exist and what are they?

b. Which digits of a superprime can be a 1, 2, 4, 5, 6, 8, and 0?

c. Are there any superprimes with more than 3 digits (other than 7331)?

Macug Newsletter



Costume Party

At a party there are: 14 girls, 11 adults without costumes, 14 women, 10 girls with costumes, 24 people without costumes, 8 women with costumes, and 10 males with costumes. How many people are at the party?

Yea, Team!

Of the members of three athletic teams in a certain school, 21 are on the basketball team, 26 are on the baseball team, and 29 are on the football team. 14 play baseball and basketball; 15 play baseball and football; and 12 play football and basketball. Eight are on all three teams. How many members are there altogether?

The Mathematics Student

Emily Lime

Emily Lime
Has a marvelous time
Giving her friends palpitations:
Arranged in this rhyme
As EMIL
Y
LIME

She's a problem in multiplication. (Each letter stands for a different digit.)

Run Jeff, Run

If Matthew can beat Jeff by one-tenth of a mile in a two-mile race and Jeff can beat Steven by one-fifth of a mile in a two mile race, by what distance could Matthew beat Steven in a two-mile race?

The Mathematics Student

Thinkers' Corner

© **Layman E. Allen**

WORD PUZZLES

How many of the problems (a) through (f) below can you solve by forming a network of words that have exactly as many letters as the number listed as the GOAL? (Suppose that each symbol below is imprinted on a disc.)

To qualify as a network

(1) all sequences of discs across and down must be words,
(2) the words must have two or more letters and not be proper names,
(3) all of the discs in the REQUIRED column must be used,
(4) as many of the discs in PERMITTED as you wish may be used, and
(5) at most one of the discs in RESOURCES may be used.

Example: The number of letters in the words of the network
CAT is 7: CAT=3, TO=2, ON=2
ON 3 + 2 + 2 = 7
The number in the network CAT is 3.

PROB.	GOAL	REQUIRED	PERMITTED	RESOURCES
[a]	7	S M	E H T	E F L P R
[b]	10	A E O	M S P Z	G I K O R T U
[c]	12	F O O	F O O	M N O P Q R S T
[d]	14	C V X E	E H O N	B D J K L M W Y
[e]	18	A A C P	E O R T	A B D E F H I R
[f]	22	E L R M T	A E H O O V	B E J L N P S U Y Z

Some Suggested Answers (Frequently there are others):

[a] M E S H E

[b] M A T E S O

[c] T O O O F F

[d] V C O M E X H E Z

[e] C O T A R E P E A

[f] L O V E H A R M T O E Z

If you enjoy this kind of puzzle, you may like playing ON-WORDS. The Game of Word Structures. Free information about this and other instructional games is available upon request from The Foundation for the Enhancement of Human Intelligence, 1900-W Packard Road, Ann Arbor, MI 48104.

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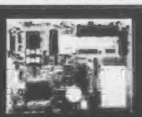

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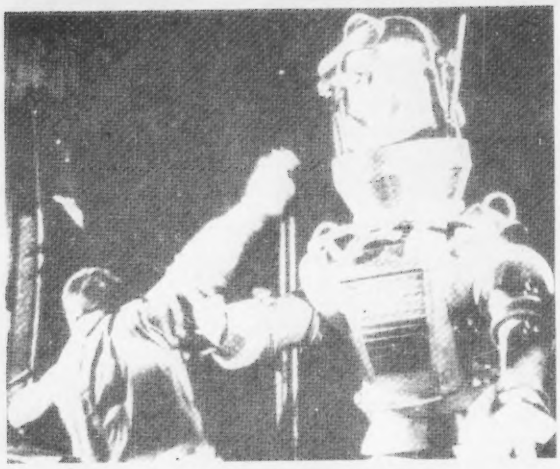


Tobor the Great attacks a kidnapper spy in this 1954 film.

Robots in Fiction

Bruce V. Haskell

> "The damned Frankenstein complex," said Bogert, consciously imitating one of the other's pet phrases.
>
> From *Lenny*, by Isaac Asimov

The first mention of robot-like machines is found in the twilight of remote mythology. Vulcan, the limping god, is attended by handmaidens of gold who were said to resemble "living young damsels, filled with minds of wisdom." An enormous stone colossus was built by Aurora to commemorate the death of her son, Memnon, Son of the Dawn, during the battle of Troy. Two sources, Juvenal and Strabo, tell us that the colossus made vocal sounds when struck by the rays of the morning sun. The island of Crete was guarded by Tallus, a giant metal man who strode the cliffs, challenging all who would enter or leave the kingdom of Minos. Any ship approaching Crete without the king's permission was crushed by Tallus' huge club.

In the Middle Ages, Roger Bacon was reputed to have created a speaking head. This head had the rather singular distinction of having been mentioned by three English poets: Butler, Pope, and Byron. We are told that Bacon had wanted Britain surrounded by a wall of brass for protection against invaders. A speaking brass head was first built to tell Bacon how the wall was to be constructed. The head took seven years to finish, and the "spirit" who was prevailed upon to make it speak informed him that if he did not hear what the head had to say, then all the labor would be in vain. Two friars sat watching the head, day and night for three weeks. Finally, they found they could not keep awake any longer, so they left an attendant on guard and went to sleep. Sometime later the head spoke, but said only, "Time is." This seemed too trivial a remark to awaken the friars, so the attendant did not. The head spoke a second time, half an hour later. "Time was." Again, the friars were not told. At the end of a third half hour, the head said, "Time is past," and collapsed.

The first of the man-made men is associated with the *golem*, found in the Bible in Psalms (139,16). It means any unformed substance or embryo, or anything incomplete, like an eyeless needle. According to Talmudic tradition, Adam was a *golem* made of dust gathered from the four corners of the earth and created in twelve hours.

The medieval alchemists sought to create *homunculi* or little men, to help them in their laboratories. One recipe for the creation of a homunculus is as follows:

Let the semen of a man putrify by itself in a gourd glass with the highest putrefaction of the *venter equinus* (horse dung) for forty days, or until it begins at last to live, move, and be agitated, which can easily be seen. After this time it will be in some degree like a human being, but nevertheless, transparent and without body. If now, after this, it be every day nourished and fed cautiously and prudently with the arcanum of human blood, and kept for forty days in the perpetual heat of a venter equinus, it becomes, thenceforth a true and living infant, having all the members of a child born from a woman, but much smaller. This we call a homunculus; and it should be afterwards educated with great care and zeal, until it grows and begins to display intelligence. Now, this is one of the greatest secrets which God has revealed to mortal and fallible man.

In 1816, at the age of twenty-two, Percy Bysshe Shelley, one of the great lyric poets of the English language, eloped with one Miss Mary Wollstonecraft Godwin. This romantic event was made slightly irregular since Shelley was at the time a married man. Because of the rather obvious problems, they went to live along the shores of Lake Geneva in Switzerland, with George Gordon, Lord Byron.

Luigi Galvani and Alessandro Volta were the talk of the scientific world at that time because of their work with electricity. Galvani had made frog legs jump electrically, and people were interested in the relationship between electricity and life. One evening a small group including Byron, Shelley, and Mary Godwin were talking about this idea of creating life. Byron and Shelley both felt that real life could not be given, but might be brought back to a corpse by galvanic methods. In fact, it might be possible to give life to a body assembled from parts of other bodies.

That night Mary lay awake, and began to see the idea of her story. She thought of it only as a short story, but when she told Shelley, he insisted that she write a novel. Both Byron and Shelley thought they would write fantastic novels, but it was Mary who eventually did. She wrote everywhere, carrying her manuscript around with her.

At the end of the year 1816, the first Mrs. Shelley committed suicide, and Shelley and Mary returned to England to be married and to have her *Frankenstein* published. The novel was first sold in 1818, when Mary was nineteen! It was a fantastic success, and has never stopped fascinating people. Percy Bysshe Shelley may be THE Shelley to scholars, but there is little question that

Mary Wollstonecraft Shelley has had the greater effect on the average person.

The monster that Frankenstein created was about eight feet tall, and extremely frightening. Frankenstein, a student of anatomy, assembled this being (it had no name) in his laboratory and gave it life with a huge electric shock. The monster went insane because of the fear it inspired in those people to whom it turned for help. It revolted against humanity, and especially its creator, Frankenstein. In the end it killed all of Frankenstein's family, including his son William (seemingly modeled on Mary's son Willmouse). Then the monster wandered off, presumably to die of remorse.

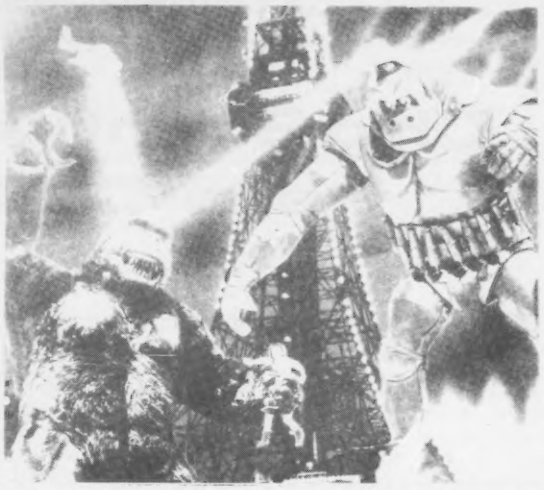
The moral of *Frankenstein* was obvious. It is sacrilegious to create a soul. This kind of inevitable wrongdoing by the monster robot continued until modern times, specifically with the stories of Isaac Asimov.

Boris Karloff as Dr. Frankenstein's monster.

But before Asimov, there was one more important phase in fictional robot development. It came in 1921, when Karl Capek wrote *R.U.R.* Capek was a Czech, and it is from the Czech word *robota* meaning servitude or forced labor that we have the English word robot. *R.U.R.*, written in play form, was translated into English in 1923. R.U.R. stands for Rossum's Universal Robots.

Like Frankenstein, Rossum discovered the secret of creating artificial life. His robots are created to be workers, but things do not work out as Rossum plans, because mankind, its motivation now lost, ceases to reproduce itself. Politicians show the robots how to make war, and finally the robots rise in rebellion to destroy what is left of mankind and take over the world.

Dr. Issac Asimov, who worked professionally in the field of biochemistry at the Boston University School of Medicine, was the first to realize that the creator does not have to be destroyed by his robot creation. Just as knives are made with handles so that they may be held safely, and electric wires are insulated so that they do not give shocks, so too the robot may be put under control by application of a few simple laws. These laws have made Asimov the true father of modern fictional robotics.



King Kong fights the King Kong Robot in the fantastic Japanese film.

The First Law of Robotics: A robot may not injure a human being, or through inaction, allow a human being to come to harm.

The Second Law of Robotics: A robot must obey the orders given it by human beings, except where such orders would conflict with the First Law.

The Third Law of Robotics: A robot must protect its own existence, as long as such protection does not conflict with the First or Second Laws.

In Asimov's stories these laws form an integral part of a robot's "positronic" brain. As he describes it, the positronic brain is a platinum-iridium sponge with brain passages marked out by the production and destruction of positrons. Dr. Asimov confesses that he does not really know how the positronic brain works, but it permits his robots to escape from the seemingly inexorable fate of all previous robots. Now it is impossible for a robot to turn on its masters.

The design of robots required a whole new science called "robotics." Robotics is a word coined by Asimov, although it seems the only natural name for the science. Dr. Susan Calvin became fiction's first robopsychologist. A robopsychologist is not a robot who is a psychologist, but a psychologist who is also a roboticist. She went to work for United States Robots and Mechanical Men, Inc. At first U.S. Robots was not allowed to make robots for use on Earth. They could only be used on the moon and colonized planets. This was due to that "damned Frankenstein complex." But after a relatively short time it was seen that robots did not — in fact, could not — break the laws of robotics, and they were permitted on Earth.

The time is rapidly approaching when science fiction will become science fact, as it often does. Whether Jules Verne foresaw the Nautilus and a trip to the moon or was part of the inspiration for them is a moot point, but robots will soon be a fact.

The human brain has an estimated storage capacity of between 10^{10} and 10^{15} bits (the *Encyclopaedia Britannica* represents about 2×10^{9} bits). We will soon be able to pack electronic memory with this same density. Disney's Hall of Presidents presents astonishingly real mechanical men. These technologies will inexorably meet to form robots. When they do, robots must be under some form of built-in control like the Laws of Robotics. If not, the fictional stories of Frankenstein and Rossum, and the real abuses of the telephone system by the "phone-freaks" and their blue-boxes, the potential misuse of centralized personal-data files, or electronic embezzlement, may seem very mild by comparison. ■

Ohio Scientific Superboard II and Challenger 1P

Randy Heuer

Anyone who has been thumbing through a recent issue of *Creative Computing*, looking at the advertisements for new microcomputer systems has to be somewhat amazed by the latest entry from Ohio Scientific. The headline proclaims, "The Age of Affordable Personal Computing Has Finally Arrived." What it's referring to is the Superboard II Microcomputer. Affordable refers to the Superboard II's base price, $279.

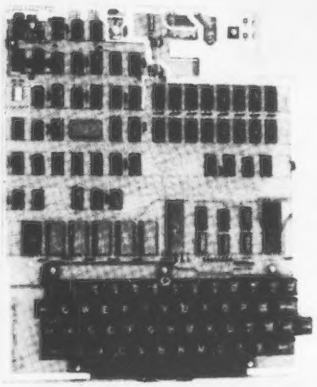
For your $279, you get an 8k BASIC-in-ROM and 4k RAM on a single board with a 53-key keyboard. All you need to start programming is a video monitor (or a standard TV using an RF modulator) and a 5 volt, 3 amp power supply. For those who don't wish to have a bare board staring them in the face, a dressed-up version of the Superboard II including power supply and case is available for $349; this is called the Challenger 1P. For an additional $69 you can have an additional 4k of RAM plugged into your Superboard II or Challenger 1P. Further memory expansion beyond 8k requires a separate expander board, available from Ohio Scientific with an additional 8k RAM for $299. This board can be further expanded to 24k, giving you a 32k system.

As with any microcomputer system now available, the Superboard II contains a number of positive features and deficiencies which the potential purchaser must consider along with his needs, skills and pocketbook before deciding which system to buy.

HARDWARE FEATURES

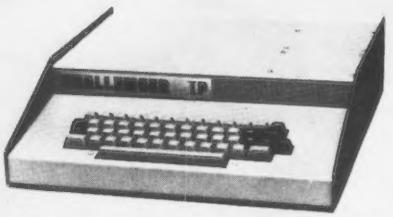
Perhaps the finest feature of the Superboard II, besides the low price, is the standard 8k floating point BASIC which comes installed in ROM. Developed by Microsoft, this full-feature BASIC has scientific notation, string operations, etc. Six and one-half digit precision is claimed by Ohio Scientific and a 9½ digit BASIC is offered on diskette for more precise applications. Based on a 6502 microprocessor, this BASIC is one of the fastest available on any microcomputer. For arcade type games this is a big plus (I have developed a 'tank' type game on the Superboard II for *Creative* which performs without undesirable pauses in execution). More on games later.

When the BREAK key is depressed, Superboard II responds with "C/W/M?". These respectively stand for Cold start, Warm start and Monitor. The cold start clears the program memory and initializes the BASIC interpreter. The warm start initializes the BASIC interpreter without destroying the program memory. This is very useful when, for one reason or another, you hit the BREAK key, and then don't have to (or can't) reload the program from tape. The Monitor allows you to directly examine and alter machine code.



Superboard II. Assembled; requires 5V power supply, video monitor, and cassette recorder to be up and running.

The keyboard is a standard "Typewriter Style" keyboard. Both upper and lower case characters are available, although lower case can not be used in BASIC instructions. Unfortunately, very few editing features are available. A line delete and character



Challenger 1P. "Cosmetic" version of the Superboard complete with power supply and case.

rub out are provided (however the rub out does not backspace the cursor, but instead prints underlines. This is rather disconcerting compared to systems with a backspace). The display is not memory mapped and no cursor commands are available, so corrections to code already entered are made by retyping the line. If you intend to do a lot of your own programming, this can be aggravating.

The 300 baud cassette is a bit slow, but fortunately Ohio Scientific has arranged for the program being loaded to be displayed on the screen as it loads. Thus you can see if the program is being loaded correctly without waiting until the tape is finished. This is an especially nice feature compared to systems on which you have to load an entire program before you know if you have an error in Line 1.

VIDEO DISPLAY

The video display has good and bad points. First the good news: The character set is one of the most extensive available, consisting of 256 alphanumeric and graphic symbols. Characters for racing cars, houses, tree, ships, planes, tanks and even the Starship Enterprise are provided. Combined with the fast BASIC interpreter and CPU, this suggests that many arcade style games will be available as software in the future. Of course, you always can write your own! And when you do, you'll have a

good source from which to draw new ideas.

The display is normally 26 characters high by 24 across. This is a very low horizontal density (characters per line), and herein lies one of the major drawbacks of Superboard II. Due to the relatively small number of characters that can be displayed at any one time (624 characters for the Superboard II as compared to 800 for the Commodore PET, and 1792 for the Exidy Sorcerer), the characters appear very large. On our 12" monitor, each character is almost ⅜" on a side. While this feature is great for graphic symbols such as tanks and the like, it is a definite problem with alphanumeric output and program listings. Due to the large character size and close vertical proximity of the characters, readability of text is poor. I have frequently found it necessary to double space all output during software development, which effectively reduces the number of lines (of 24 characters) that can be viewed at any one time to 13. In addition, long program statements (ON X GOTO's, etc.) often take up as much as 3 lines in a listing, further reducing the amount of code which can be viewed at any one time. Thus, the display should be examined carefully by a potential purchaser to be certain that the extensive graphic character set (and low price!) more than compensate for the lack of ease in programming.

While I am not an expert on hardware, it seems as though this problem could have been avoided by Ohio Scientific. The Challenger IIP has a feature which allows the user to switch from a 32 x 32 character format to a 32 x 64 format (see *Creative Computing*, May/June 1978). It would be very desirable if the Superboard II had a similar feature. Listings could be viewed in the 64 character format and then the display could be switched to the 32 character format for graphics.

Another problem with the display results from the lack of any cursor commands. Essentially, the cursor remains on the same line of the screen at all times. Thus you must use scrolling to clear the screen or format output. Alternatively, you can use POKE statements to enter a character at a given screen location. For our graphic routines here at *Creative*, I've developed a series of Pseudo-cursor command subroutines for use with POKE statements in order to move characters about the screen. [See box.] Obviously cursor commands with PRINT statements would be easier if they were available.

PSEUDO-CURSER CONTROL COMMANDS FOR THE OHIO SCIENTIFIC SUPERBOARD II

The following programming example demonstrates how special characters are moved about the screen using the Superboard II computer. In this example, a tank(special character 248) is moved up the screen 5 spaces, turned 90 degrees to the right(special character 250) and moved 4 spaces to the right.

```
 10 PC=54029:REM**SET PRESENT CURSER POSITION
 20 TK=248:REM**SET TANK SYMBOL
 25 POKE PC,TK:REM**PLACE TANK AT STARTING CURSER POSITION
 30 REM**MOVE TANK VERTICALLY 5 SPACES
 40 FOR I=1 TO 5
 50 GOSUB 6000:REM**MOVE CURSER UP 1 SPACE
 60 POKE NC,TK:REM**PLACE TANK IN NEW CURSER POSITION
 70 POKE PC,32:REM**PLACE BLANK IN OLD CURSER POSITION
 80 PC=NC:REM**ESTABLISH NEW CURSER POSITION
 90 NEXT I
100 TK=250:REM**CHANGE TANK SYMBOL
110 POKE PC,TK:REM**TURN TANK
120 REM**MOVE TANK 4 SPACES TO THE RIGHT
130 FOR J=1 TO 4
140 GOSUB 7000:REM**MOVE CURSER TO THE RIGHT 1 SPACE
150 POKE NC,TK:REM**PLACE TANK IN NEW CURSER POSITION
160 POKE PC,32:REM**PLACE BLANK IN OLD CURSER POSITION
170 PC=NC:REM**ESTABLISH NEW CURSER POSITION
180 NEXT J
190 END
6000 REM**SUBROUTINE TO MOVE CURSER UP ONE SPACE
6010 REM**PRESENT CURSER POSITION IN PC
6020 REM**NEW CURSER POSITION IN NC
6030 NC=PC-32
6040 RETURN
7000 REM**MOVE CURSER TO THE RIGHT ONE SPACE
7010 NC=PC+1
7020 RETURN
```

Similar pseudo-curser commands can be developed for all other directions, including diagonals.

DOCUMENTATION

The documentation that was provided with the Superboard II was substantial in quantity, but less substantial in quality. We received a number of separate documents in a thick 3-ring binder.

The Superboard II Users Manual was marked preliminary as of August 1978. It contained an adequate section on setting up the system and loading programs from tape. It also contained a short introduction to BASIC and some sample programs that would have been much more valuable to the new user had they contained some explanation of why they do what they do. Hopefully the final version of the Users Guide will be better.

The 8k BASIC-in-ROM Reference Manual was rather disappointing. It contained only a brief discussion of BASIC and a short list of BASIC commands and error codes. Users with programming experience will find this manual of little use and beginners will probably find it hard to understand.

The best manual for usefulness and readability was the Character Graphics Reference Manual. It demonstrated and explained the use of the character set with POKE statements and the technique used to poll the keyboard during program execution. It had some excellent examples and demonstration programs. Unfortunately, rather than being a separate manual for the Superboard II, instructions are mixed with those for the Ohio Scientific 540 Video Board. This requires some close reading on the user's part.

The remaining manuals were devoted to schematics and technical information which would not normally concern the average user.

WRAPPING IT UP

Ohio Scientific appears to be ready

Creative Computing's Superboard II was up and running five minutes after unpacking.

to support their new system with accessories such as disc drives and future software (the few early software tapes sent to us seemed to need a little more work; perhaps their final issues have been improved). Whether other software companies provide a substantial volume of Superboard II software remains to be seen (*Creative* is planning several tapes). Obviously just how much software eventually becomes available depends largely on the demand for it.

So whether the Superboard II is right for you depends on what you want out of your Microcomputer System, and what you are willing to put into it. If you consider features such as extensive graphic capability, speed of execution and price important, then the Superboard II and companion Challenger IP deserve your serious consideration. ■

Over the past four years we have taken delivery on over 25 computer systems. Only two have worked totally glitch free and without adjustment as they came out of the carton: The Tektronix 4051 (at $7000, the most expensive computer we've tested) and the Ohio Scientific Superboard II (at $279, the least expensive). Problems with others ranged from simple problems like cassette recorder volume/tone adjustments and RF modulator adjustments to more serious problems like head misalignment and broken connectors, to quite serious deficiencies like 5 faulty ICs on one system and the wrong controller circuit on another.

Personally I was impressed that we successfully loaded a long program from tape within 5 minutes of the Superboard II coming out of its box. We could use more good engineering like that.—DHA

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CIRCLE 165 ON READER SERVICE CARD

THE SUN

(a play)

Instructions: Build a stage in the middle of an open field. Have the audience seated on this stage. Have plenty of refreshments available.

Act I

THE SUN: The sun rises with a show of spectacular colors and pageantry. OPTIONAL: (clouds may be used to heighten the effect, along with chirping birds.)

THE AUDIENCE: Bursts into applause, with oohs and aahs interspersed.

Intermission (approximately 6½ hours)

Act II

THE SUN: The sun reaches the highest point in the sky.

THE AUDIENCE: Cheers and claps, but with some catcalls intermixed—in anticipation of the sun's imminent descent. (NOTE: if stage is located at the equator, **wild** *cheering in appreciation of the extra effort.)*

Intermission (approximately 6½ hours)

Act III

THE SUN: The sun sets below the Earth's horizon—very colorful, but more austere and formal than in Act I.

THE AUDIENCE: A foreboding atmosphere prevails, as the audience claps in both appreciation and relief. As the sun begins to disappear the audience grows tense. Two or three people faint when the finality of the act becomes apparent. Some demand their money back.

(Just before the curtain of darkness falls, a plane flies overhead and skywrites in large white letters; THE END.)

RANDOM THOUGHT 201

On the first day of class our assignment was to draw up a list of random things. So I came up with a group which I thought pretty much illustrated the concept:

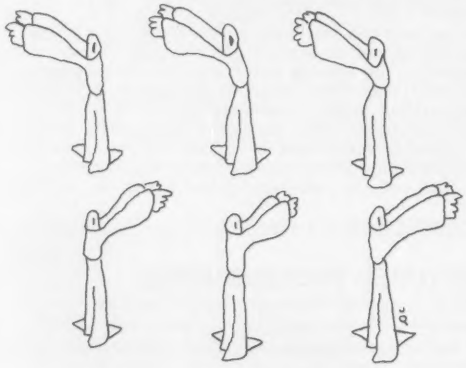
1) *Battleships in WW2.*
2) *1347 A.D.*
3) *Things Einstein ate for breakfast in 1907.*
4) *Sexual reproduction in trilobites.*
5) *Punctuation marks in sign language.*

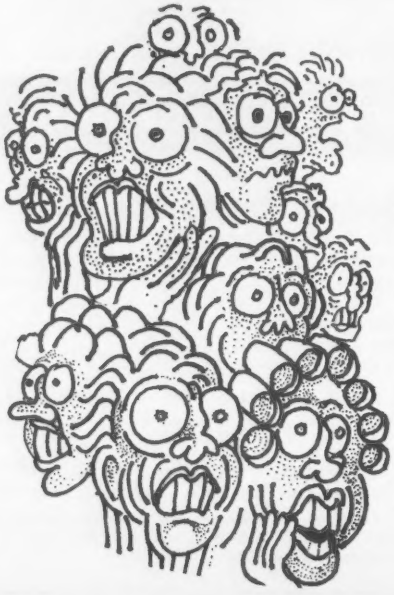
I handed it in, and got a C minus. "Not enough aimlessness in design," was the note scrawled in what looked like the ancient ascript on the tomb of a dead Pharaoh. I was pretty upset.

As the term got along the instructor took on a more haphazard manner. Sometimes he would lecture on imaginary numbers, at others: the invention of money, balloons, Nietzsche's hygienic habits, why stars twinkle only at night, etc. Sometimes he didn't show up. Now and then we didn't show up. And one time we all showed up, but he didn't say anything. He just stared and smiled in an ecstatic sort of way, winking occasionally at individual students, in an attempt to keep our attention.

By the end of the term, I was catching on to his game. So for his final exam I dropped out of school, moved to North Dakota, enrolled in a Russian ballet class, and in a light-hearted patriotic moment tattooed "Don't tread on me" on the heels of my feet.

Unfortunately, I missed the last day of class when I was packing for my move to North Dakota. I didn't find out until it was too late that the exam was cancelled.





THE ULTIMATE PARTY

All 74 billion people who once inhabited the Earth, are invited to a party. The invitations state 8 p.m., and to my surprise give my apartment as the place. The dress is casual. They all arrive within a couple of hours of each other. But the party's a bomb. There is very little food, no space, and the various languages present a communications problem. After a while tempers grow short and fights break out. One in the kitchen is unusually violent for a party and a man is stabbed. He turns out to be the first man. He dies. In turn everyone else disappears in order of birth, dating back almost 3 million years. This takes some time, and goes on well into the middle of the night. Finally I am left alone with 74 billion cups and glasses to clean. I put it off until morning.

Peter Payack

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CIRCLE 129 ON READER SERVICE CARD

Behind the Scenes at the 3rd West Coast Computer Faire

We'll be bringing you a report on some of the new products unveiled at the West Coast Computer Faire next issue, however, we thought you'd like to see what it's like before a major conference opens. Maybe one of these issues we'll show you the aftermath too!

Backdrops are hung, tables draped and small booth signs are hung about 1 day in advance.

Hardware is checked out (and repaired if necessary, hopefully, but not always before the show opens).

Even the biggies (IBM shown here) are not immune from hardware glitches.

Radio Shack brought eight TRS-80 systems and tons of literature.

Jacki Berry letters the signs for Jade on the spot.

C.J., Dave, and Phil try to find a place for everything in Creative's booth.

The show floor from above about 5 minutes before the doors opened to the seething masses.

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CIRCLE 130 ON READER SERVICE CARD

WHO NEEDS ONE?

"Your work will be cut in half ... so they said
Payables, and invoicing will no more be dread.
General ledger and billing will be done ... one, two, three
It's all really simple .... Just wait and see.

No need to run parallel, you'd be a fool
Anyone can do it, no need for a school
It's simple, accurate, timely and fun
Just turn on the printer ... your job will be done."

The abacus served me for many a year
My pencil and paper to me were quite dear
I knew how to work them, took pride in my skill
I think something was happening against my will.

"I know nothing about it," ... "You can't live without it."
"I don't know, it's confusion" ... "Take my word, it's illusion."
"Are you sure I can do it?"
"If you'll only pursue it!"

I wondered the outcome when we finally went live
Would I still be in business, could I really survive?
My office girls worked it, I watched with hesitation
I still wasn't certain, had much reservation.

The next day I found out the thing didn't work
I thought for a moment I might go berserk
I turned every knob and pressed every button
Did just what they told me, but the damn thing did nothin'.

I dialed a number and ranted and raved
(Later I was ashamed of the way I behaved)
"Nothing's happening," I told them, "nothing at all."
That's when I noticed ... the plug out of the wall.

Sheepishly, timidly I hung up the phone
I'm certainly glad I was there all alone.
It wasn't a minute till the employees came in
I watched them start the equipment ... easy as sin.

Two weeks have passed, and no more am I spastic
A few program problems, but nothing too drastic.
I'm back to my normal routine of the day
I have too much to do than to watch my help play.

My work involves talent and much ability
I say that, of course, in all humility.
My product is certainly one of the future
Oh, didn't I tell you? I distribute computers.

Eunice M. Conn

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Watch for fabulous TRS-80 Level II releases in the February Creative Computing!

Radio Shack TRS-80 Software

CS-2001. TRS-80 4k Level I Games-1. Battling **Deathstars,** an exciting two player realtime graphics game. **Hangman** challenges you to guess the computer's word before you're hung. **Lunar Lander** in which you try to land safely on the moon. Kid's **Math Race** teaches simple arithmetic. Or play **checkers** against your TRS-80. $7.95.

Apple II Software

CS-4001. Space Games-1. Four color-graphics programs for your Apple, including **Rocket Pilot** an advanced lunar lander simulation in which you guide your spacecraft over the mountain to a safe landing on the opposite side. In **Saucer Invasion**, you protect the earth by shooting down the alien invasion fleet with your missile launcher. In **Star Wars**, you line up the Tie fighters in your sights and fire before they get away. **Dynamic Bouncer** is a color graphics demonstration program for your Apple which fills the screen with colored walls that appear and disappear at random, while a ball bounces around within. $7.95.

CS-4002. Sports Games-1. Four exciting graphics games. Includes an amazing **Baseball** game for two players who control infielders and outfielders, type of pitch, and the swing of the bat. Even has sacrifices, double plays, and home runs. **Horse Race** allows up to eleven players to bet on the outcome of a horse race. **Slalom** challenges you to ski through the gates in a minimum time. In **Darts** you try to throw your darts as close to the bullseye as possible by controlling the game paddles. $7.95.

CS-4003. Strategy Games-1. Play **Checkers*** in color against the Apple. **Skunk** is a dice game for one or two players. **UFO** is a space game in which you must outwit an enemy spaceship. **Blockade** with exciting graphics and sound effects, with a one or two player option. **Genius,** a challenging trivia quiz. *Requires Applesoft BASIC. $7.95.

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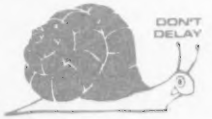

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A Word About Tape Quality

Calendering is just one of the many high quality features you'll find in Creative Computing Software cassettes. We could have purchased cassettes for half the price that would have worked, but we wanted to be sure that our cassettes would last for years and would give you an error-free program load *every* time.

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Speed Reading Made Easy ... via your PET

Tom Rugg
Phil Feldman

This program turns your computer into a tachistoscope (tah-KISS-tah-scope). A tachistoscope is used in reading classes to improve reading habits and, as a result, improve reading speed. The program displays a word or phrase on the screen for a fraction of a second, then asks you what it was. With a little practice, you'll find that you can read phrases that are displayed for shorter and shorter time periods.

How To Use It

The program starts off by displaying a brief introduction, and waiting for you to press any key (except the "stop" keys or shift keys, of course). After you press a key, the screen is blanked out except for two horizontal dash lines in the upper left-hand corner. After two and a half seconds, the phrase is flashed on the screen between the two lines. Then the screen is blanked out again, and you are asked what the phrase was.

If you respond correctly, the next phrase is displayed for a shorter time period (.05 seconds less). If you respond incorrectly, the program shows you what the phrase was, and the next phrase will be displayed for a longer period of time (.05 seconds more).

The fastest the Commodore PET can display a phrase and erase it is about .02 seconds (one-fiftieth). See if you can reach the top speed and still continue to read the phrases correctly.

A lot of research has been done to determine how people read and what they should do to read faster, with better comprehension. We won't try to explain it all, but a couple of things are worth mentioning.

To read fast, you should not read one word at a time. Instead, you should learn to quickly read an entire phrase at once. By looking at a point in the center of the phrase (and slightly above it), your eyes can see the whole phrase *without* the necessity of scanning it from left to right, word by word. Because the tachistoscope flashes the entire phrase on the screen at once, it forces you to look at a single point and absorb the whole phrase, rather than scanning left to right, word by word.

If you can incorporate this technique into your reading, and increase the width of the phrases you absorb, your reading speed can increase dramatically.

Easy Changes

a. Change the phrases that are displayed by changing the DATA statements that start at line 910. Add more and/or replace those shown with your own phrases or words. Line 140 must specify a number that is at least as large as the number of DATA statements. So, to allow for up to 100 DATA statements, change line 140 to say

```
140 L = 100
```

Be sure to enter your DATA statements in the same form shown in the program listing. You may want to start off with shorter phrases or single words to begin with. Later, try longer phrases. Do not alter line 9999, which has to be the last DATA statement. In a 4K PET, you have room for about 60 phrases of the approximate size shown in the program listing. In an 8K PET, you can probably have over 200 of them. Be sure to have at least 6.

b. To change the length of time the first phrase is displayed, change the value of T in line 120. If one-tenth of a second is too fast, try two-tenths. Use a multiple of .05 seconds, or else make it .02 seconds (the maximum speed).

c. To cause all phrases to be displayed for the same length of time, remove lines 570 and 720.

d. If you want to change the waiting period before the phrase is flashed on the screen, change the 1500 in line 465. To make the delay five seconds, change it to 3000. To make it one second, change it to 600.

EDITOR'S NOTE

This is a chapter from the new book 32 BASIC Programs for the Commodore PET Computer, *written by Tom Rugg and Phil Feldman. It's available at most computer stores, or from dilithium Press, P.O. Box 92, Forest Grove, OR 97116 (reprinted with permission).*

At the end of the article are some notes about how you can convert the program for use on other computers.

e. To put the program into a sort of flashcard mode, in which the phrases are flashed, but no replies are necessary, insert these two lines:

```
515 GOTO 710
715 GOTO 590
```

This will cause each phrase to be flashed (all for the same length of time), and then displayed again so you can verify what it was.

Main Routines

120 - 150 Initializes variables.
160 - 220 Reads DATA statements into T$ array.
260 - 380 Displays introduction.
400 - 420 Waits for operator to press a key.
430 - 450 Picks random phrase from T$ array. Ensures no duplication from previous 5 phrases.
460 - 465 Clears screen and displays horizontal lines.
470 - 500 Displays phrase for appropriate length of time.
505 - 530 Waits, then asks what the phrase was.
550 Determines if typed phrase matches the phrase displayed.
560 - 640 Shortens time for next phrase if reply was correct. Saves subscript to avoid repetition. Goes back to 400.
700 - 740 Shows what phrase was. Lengthens time for next phrase. Ensures that time period is a multiple of .05 seconds.
800 - 810 Special routine to display phrase for shortest time (about .02 seconds).
840 - 870 Subroutine to display horizontal dash lines.
910 - 9999 DATA statements with phrases to be displayed.

Main Variables

T Time (seconds) that phrase will be displayed.
J Number of "jiffies" that the phrase will be displayed.
B ASCII number for character to clear screen.
L Limit of number of phrases.
T$ Array of phrases (read into from DATA statements).
C Count of number of phrases actually read.
R$ Temporary string variable. Also, reply of operator.
R Work variable. Also, subscript of phrase to be displayed.
P1, P2, P3, P4, P5 — Subscripts of the 5 previous phrases.
S Starting time of display of phrase (in jiffies).
K Temporary work variable.

Suggested Projects

a. Instead of picking phrases at random, go through the list once sequentially. Change line 250 to set R to zero, and line 430 to add one to R, then check if R is greater than C.

b. Instead of only verifying that the current phrase doesn't duplicate any of the previous five phrases, modify the program to avoid duplication of the previous ten or more. Changes will be needed to lines 440, 450, and 600.

c. Keep score of the number of correct and incorrect replies, and display the percentage each time. Alternatively, come up with a rating based on the percentage correct and the speed attained, possibly in conjunction with a difficulty factor for the phrases used.

d. Add the capability to the program to also have a mode in which it can display a two to seven digit number, chosen at random. Have the operator try several of the numbers first (maybe five-digit ones) before trying the phrases. The phrases will seem easy after doing the numbers.

Conversion Notes

Although this program uses several special features of the Commodore PET 2001 computer, it can be converted fairly easily to work on many other computers, too. You need to have a pretty

fast CRT display (at least 600 baud, with 1200 baud or more being preferable). You also need to have the BASIC language, preferably a Microsoft-compatible version (e.g., Altair, Radio Shack Level II, OSI, etc.). Here are a few notes:

1. PRINT CHR$(147) and PRINT CHR$(B) on lines 260, 500 and 800 cause a "home up, clear" to occur. That is, the cursor moves to the upper left corner and the screen is cleared.
2. Line 250 randomly initializes the RND function using the PET's internal timer as a seed.
3. Line 860 performs a "home up." The cursor moves to the upper left corner, but the screen is not cleared.
4. Lines 480 and 490 handle the time delay for each phrase to be flashed on the screen. The variable TI is reserved on the PET to get the current measurement of the PET's internal timer in "jiffies" (one-sixtieth of a second). If you have no internal timer, leave these two lines out to cause the phrases to be flashed as fast as possible. You can insert a FOR-NEXT loop to cause variable length flashes, if you like.
5. The GET function in line 420 is used to determine when a key has been pressed, so you can indicate when you are ready to continue. Also, line 400 has a GET in a loop to ignore up to 5 keys that may have been pressed too soon. You might want to substitute an INPUT statement to accomplish this, or else possibly use the INP function. ■

```
**** TACHISTOSCOPE ****
THIS PROGRAM IS DESIGNED TO
IMPROVE YOUR READING SPEED.

I'LL BRIEFLY DISPLAY A SHORT
PHRASE, AND YOU TRY TO READ IT.
TYPE WHAT YOU SEE, AND I'LL TELL
YOU IF YOU WERE RIGHT.
WE'LL START AT .1 SECONDS.
PRESS ANY KEY WHEN YOU'RE READY.
```

The program displays an introduction, then waits.

```
-----------

-----------
```

The program clears the screen and displays two parallel lines in the upper left corner of the screen for a couple of seconds.

```
-----------
AT THE TIME
-----------
```

The program flashes a short phrase (chosen at random) between the two lines for one tenth of a second, then clears the screen.

```
WHAT WAS IT?
? AT THE TIME
 THAT'S RIGHT!

THE NEXT ONE WILL BE DISPLAYED
FOR .05 SECONDS.

PRESS ANY KEY WHEN YOU'RE READY.
```

The program asks what the phrase was. The operator responds correctly. The program acknowledges the correct response, and indicates that the next phrase will be shown for a shorter length of time.

Some things are just naturally right.

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World Chess Championship Computer

As a spectator sport, computer chess can be rather boring. The developers of Chess 4.6 are coming up with an innovative method of making it much more interesting!

Theodore Ehora

A classic confrontation, along the lines of the Fischer-Spassky match, was anticipated in the World Computer Chess Championship that took place in Toronto in 1977. Although there were sixteen entries, representing eight countries, excitement was generated by the expected clash between Chess 4.6, a Northwestern University program from Evanston, Illinois that was authored by Lawrence R. Atkin and David J. Slate, and Kaissa, the Soviet program created by a ten-man team from the Institute of Control Sciences in Moscow.

Kaissa, named after the mythical goddess of chess, was the defending champion, having scored four straight wins at the first championship that took place in Stockholm during August of 1974. Three years later in Toronto, Kaissa was meeting its first serious competition since it had won the title. The Russians, because of their great popular enthusiasm for the game, had programmers working full time to develop their electronic champion.

In contrast, Chess 4.6 was a spare time hobby for its two authors. Its most recent achievements before the Toronto tournament ranged from winning the Minnesota Open (for humans) to winning the U.S. Computer Chess Championship. It had been improved since losing the first world championship, then named Chess 4.1, but it was unknown whether these innovations could beat Kaissa.

In the first round of the tournament the unexpected happened. Kaissa faced Duchess, a chess playing program from Duke University. Duchess beat the Soviet program after 48 moves. Although Kaissa pulled itself together and defeated the rest of its opposition, it was still beaten by Chess 4.6, which defeated all its opponents and won the title.

An exhibition game between Kaissa and Chess 4.6 only added salt to the Soviet wound. Kaissa lost that game after 44 moves.

Winning the computer chess championship was the last thing on the mind of David Slate, as he walked through Northwestern's computer center in the summer of 1968. Slate, a graduate student in physics, was in the systems bay area when he noticed a green binder with the word "CHESS" printed on it. The authors of this chess program were Lawrence Atkin and Keith Gorlen (who has since left the

project). Both Atkin and Gorlen were undergraduate students in computer science. Atkin describes his original reason for writing a chess program as a means of escaping the boredom of being a student. They had written their first program in April 1968. At the time, both of them were relatively weak players.

Slate who was an expert player, decided to write his own program and by September, 1968, Northwestern had two chess playing programs. Each of these programs had their own strengths and weaknesses. The Atkin-Gorlen program had a primitive tree search function, which allowed the computer to look ahead in moves. It also had a bad judgment of the resulting positions. Slate's program was just the opposite; it made good evaluations of the game, but was weak in looking ahead.

In 1969 Slate told Atkin that he had decided to write another program. Atkin replied that they should combine their two programs, since each of them had separate strengths and talents that they could bring to the project. The resulting program was eventually named Chess 2.0.

As they began to write their new program, they also became aware of the literature on computer chess. The new program implemented alpha-beta pruning, which greatly increased the playing strength of the program.

"I remember this scene at the console," recalled Slate, as he described the first test game of the new program. "Atkin was playing the program. It (the program) was really playing chess. Playing very sharp, very nicely. It acted as if it knew what was going on on the chess board. Punishing mistakes ruthlessly.... and at the very last moment, when it had one move to go to checkmate Atkin—of course he was quite ecstatic over this experience; the monster we had created had come to destroy us. It was just thrilling!"—suddenly when it was going to checkmate him, the display started to go completely berserk. Weird numbers appeared on the screen; fizzing and sparkling started and then it dissolved. "The program had died a horrible death; the strain was too much. Its first victory was too much for it."

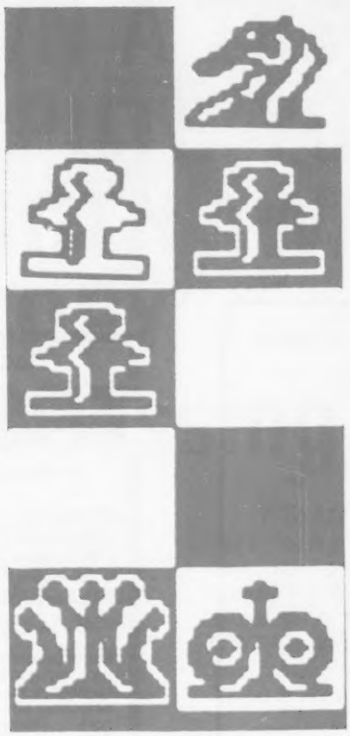
Eventually they discovered the flaw in the program. They had told the computer that it could only have fifty legal moves in one position. However the checkmate position was complex and there were over fifty legal moves available.

After play-testing their new program, they began to distribute it to various computer installations. Because the software products were usually advertised with a number after it, they decided to call it Chess 2.0. Why did they call the first version 2.0 instead of Chess 1.0?

"We wanted everyone to think they had missed the first version," said Slate, with a chuckle.

"We, on the inside, know just how flaky the whole set-up is," remarked Slate, as he described Chess 4.6, with its house language program of over 30,000 steps. "We have a certain sense that a human would make moves at a certain level, but that is not reasonable to assume for a computer. It's metal and semiconductors with electric currents running around inside. Every one of those things had to be perfect in order for it to play."

Indeed, the idea of a chess playing computer seems absurd if you look at the statistics of this complex game. According to Claude Shannon, a computer scientist whose 1950 paper pioneered computer chess, there are 10^{120} different sequences of moves that begin with the initial position of the



game. He indicated that a fast computer would take 10^{90} years to examine all the possible moves, before the first move is made.

Since all serious tournament play is timed, any chess playing computer would lose the game by exceeding the time limit if it was programmed to look at all the possible variations in a position. So how do you get a computer to "think" through a game of chess?

Chess 4.6 analyses an average of three moves ahead. Since one move by the computer can result in a variety of responses by its opponent, the computer must numerically evaluate all the resulting positions, then combine these results to assign a numerical evaluation to the contemplated move. This evaluation will reflect whether the move is more favorable for the computer or its opponent. Finally, the computer will choose the move which has a numerical evaluation that gives it the most favorable position from the possible selection of moves. The evaluation of a position considers such things as material advantage, pawn structure, king safety and mobility.

Occasionally, the computer will reject a certain move after it discovers a bad position could arise from that move. This saves the computer from wasting time in investigating useless variations.

Many of the opening moves of the game have been investigated by human players. Openings from the quiet "Giuoco Piano" to the dynamic "Sicilian" are programmed in the computer and played by rote for the first six to fifteen moves. After that, the computer begins to "think" about the position. Presently, Chess 4.6 holds over 6,000 different opening positions in its memory bank.

Chess players are categorized in classes by the United States Chess Federation, in ascending order, as E,D,C,B,A, expert, master and senior master, with class "C" being an average tournament player. The World Chess Federation bestows the higher titles of International Master, Grandmaster and World Champion, which are earned by international competition. Both Slate and Atkin rate Chess 4.6 as an expert. Atkin noted that the program plays better than either one of its creators.

"The problem of trying to rate a computer is that computers really play a different game of chess than people do," stated Atkin. "What happens is that the machine plays tactics like a Grandmaster and makes strategic moves like an 'E' class player. You end up with something in the middle."

Another interesting difference between man and machine is the fact that a chess master will often play an inferior move, gambling that his opponent will not be able to exploit it. The computer assumes its opponent will find the proper reply to all its moves.

This difference between computer and man continues to challenge Atkin and Slate. Already they have added a new innovation which allows Chess 4.6 to analyze its opponent's probable move while the opponent is thinking. Now, they hope to devise a way for the computer to build a hypothetical model of its opponent's play. By using such a model, the computer could probe its opponent's weaknesses and play a gambling move.

J.BIIT was the name of a program devised by chess master Hans Berliner. In that name he stated the basic

purpose for programming a chess playing computer: Just Because It Is There. However, practical purposes for the chess playing program have already been found. Presently, the specific techniques used for playing chess have already been used in programs that handle a telephone-switching system and an electronic-power grid.

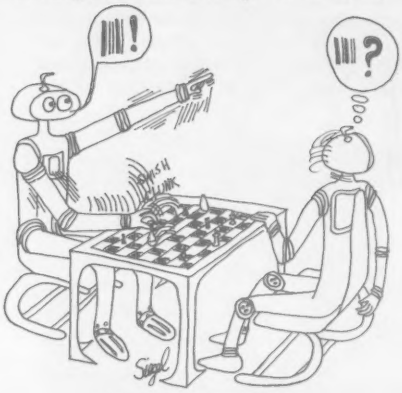
"It is a good research base," said Atkin. "If you're interested in how to make computers solve difficult problems, language translation problems, perception problems.... those kinds of problems are very difficult because there are enormous amounts of data and a huge information base. One example would be language translation problems which deal in huge vocabularies. Those are difficult problems, but they are basically similar to chess. So chess can be used as a simple problem to help solve the more difficult ones in the field of artificial intelligence."

While the future for computer chess and its practical applications looks promising, the immediate future holds plenty of challenge for Chess 4.6. Perhaps the most dramatic of these challenges is the Levy wager.

In 1968 David Levy, an International Master and computer expert, wagered that he couldn't be beaten by a chess playing computer in a ten-game match. The bet is presently for 1,250 pounds sterling (about $2,125) and has been placed with three computer scientists. Although the time limit for the bet is August, 1978, Levy has indicated that he will renew the wager after that period.

"The bet was made by Levy with three computer scientists," explained Atkin. "It is up to them to come up with a program—steal, borrow or whatever—that will play Levy. We've tenatively agreed to be that program. Right now there are negotiations going on trying to arrange the location for the match."

"One way to beat him is with a conceptual breakthrough. What we've found is that if we put our program on faster machines, its play is significantly better. (Presently Chess 4.6 is run on a CDC Cyber 176. A six-fold increase in speed gives the computer an extra half-move to look ahead.) If there is another step, another order of magnitude in the power of machines, I think that we can—well, its hard to say. I think we can beat him once in a while—that is better than I think we can do now, which is almost never."



ONE DAY AT THE FIRST ROBOTIC CHESS TOURNAMENT

Presently Atkin and Slate, along with David Cahlander of Control Data, are busy finding ways to improve Chess 4.6. One of their most recent plans is a way to cut down on the boredom of attending the program at a tournament.

"Actually, when you have a terminal, its a drag," said Atkin. "You're sitting there, with the board in front of you and the terminal on your side. The computer makes a move. You make it on the board. You sit there twiddling your thumbs while the other guy (or computer) is thinking. He makes a move. You type it in the terminal. You're just an automaton, sitting in the middle. Getting very frustrated ... it's nervewracking."

"What we're trying to do right now is build a robot that takes the place of the programmer sitting between the terminal and the board. The robot will have an arm that picks up the pieces. We'll just sit back and watch." ■

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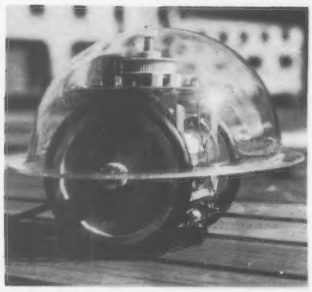

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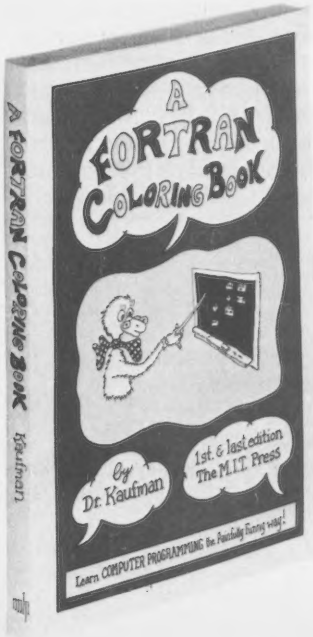
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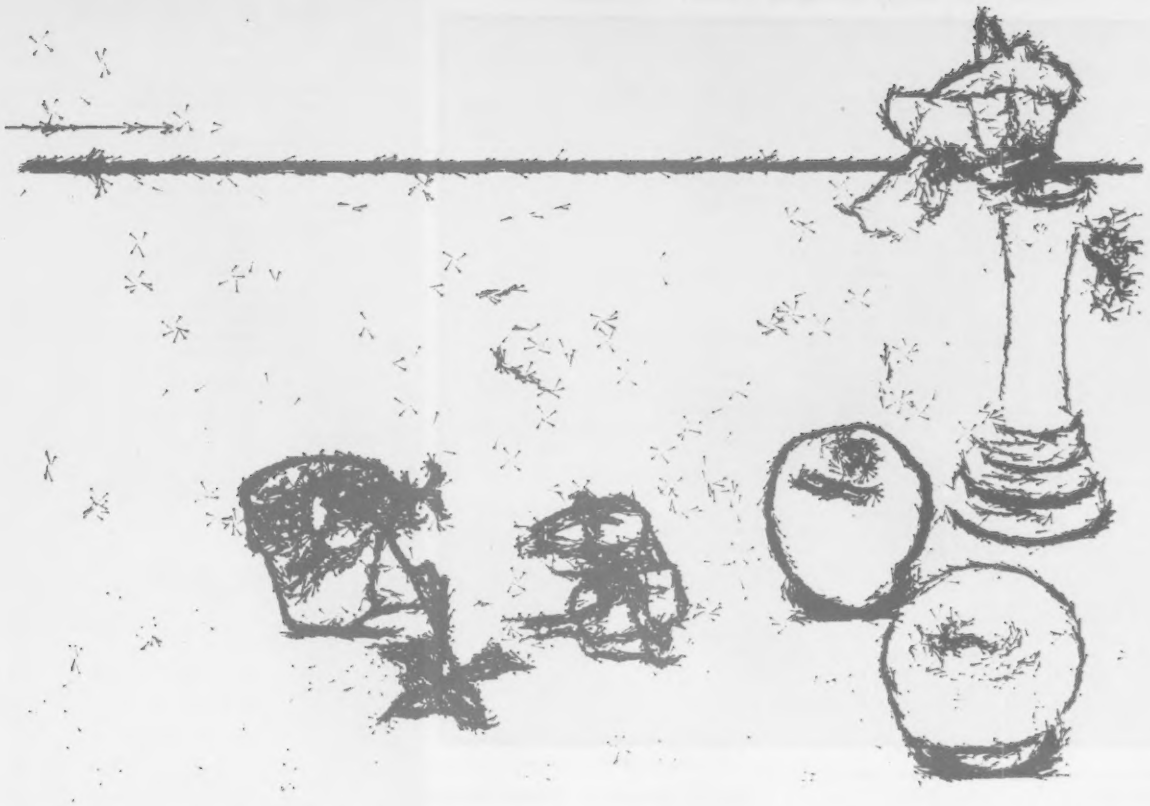

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Designed and executed by R. Michael Hord, Institute for Advanced Computation, 128 South Royal St., Alexandria, VA 22314.

COMPUTER GRAPHICS

Still Life
Young Woman
Business Man

```
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BUT I AM COMMENCING THE:

NUKELEAR DISASTER LOG:
   03:15:23.332 ABNORMAL TEMPERATURE RISE IN REACTOR CORE
   03:15:24.224 HOUSE SECURITY CHECK - RETURN CODE: OK
   03:21:54:.874 CORE TEMPERATURE STILL RISING
   03:21:55.044 INITIATE COMPLEAT COOLING SYSTEM CHECK
     COOLING SYSTEM: PUMPS NOT OPERATING
                     WATER TEMPERATURE 100 DEGREES CELSIUS
                     WATER PRESSURE 0
                     EMERGENCY COOLANT LEVEL 0
   03:22:00.533 COOLANT SYSTEM FAILURE DETECTED
   03:22:30.000 INTERUPT. COMPUTE TODAY'S SHOPPING LIST
   03:27:30.000 SHOPPING LIST SPOOLED
   03:27:30.025 REACTOR TEMPERATURE SENSOR INOPERATIVE
   03:27:30.050 REACTOR ROOM TEMPERATURE 274 DEGREES CELSIUS
   03:27:30.544 DEDUCE THAT REACTOR IS MALFUNCTIONING
   03:27:30.750 COMPUTER INTERVENTION REQUIRED - INITIATE REACTOR SCRAM
   03:27:31.332 INTERUPT. LAWN MOISTURE SENSOR
   03:27:32.445 TURN OFF LAWN SPRINKLERS
   03:28:12.122 REACTOR SCRAM UNSUCCESSFUL. NO RESPONSE FROM
                EMERGENCY SYSTEMS
   03:28:12.544 ACTIVATE FIRE AND INTRUSION ALARMS. BLINK HOUSE LIGHTS
   03:28:15.699 ACTIVATE DOOR AND WINDOW UNLOCK SOLENOIDS
   03:28:16.224 NO RESPONSE. POWER LOSS IN HOUSE CIRCUITS
   03:28:16.442 DIAL FIRE DEPARTMENT
   03:28:26.198 LINE BUSY
   03:28:43.267 REDIAL
   03:29:00.822 LINE BUSY
   03:29:12.998 TEFLEPHONE INTERFACE NOT RESPONDING
   03:29:15.936 ABNORMAL TEMPERATURE IN MARK V HOME COMPUTER
   03:29:16.22# MEM%OR) PAR<TY ERR&%"
   0*!(3!D5.?5G HEL)P ME!
   KG(3#6JJYR(4$'996>?+0)(7&5$32!EEEEEEEEEEE
```

4-Year Cumulative Index to Creative Computing and ROM

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We've cross-referenced articles that have appeared in both *Creative Computing* magazine and the *Best of Creative Computing Vols. 1 and 2*, hence, the current source of every article is listed.

Articles are classified by subject area and listed by title and author. Over 2000 separate items are included. The index does not include a cross-reference to author.

The index was put together by Jane Fletcher on a DECsystem-10 using the text editor and runoff (with a Diablo 1620).

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121	122	123	124	125	196	197	198	199	200
126	127	128	129	130	201	202	203	204	205
131	132	133	134	135	206	207	208	209	210
136	137	138	139	140	211	212	213	214	215
141	142	143	144	145	216	217	218	219	220
146	147	148	149	150	221	222	223	224	225
151	152	153	154	155	226	227	228	229	230
156	157	158	159	160	231	232	233	234	235
161	162	163	164	165	236	237	238	239	240
166	167	168	169	170	241	242	243	244	245
171	172	173	174	175	246	247	248	249	250

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1. Other magazines I read (check all that apply):
   - a ☐ Byte
   - b ☐ Computerworld
   - c ☐ Interface Age
   - d ☐ Kilobaud
   - e ☐ Personal Computing

2. What, if any, personal computer do you have (check only one):
   - a ☐ TRS-80
   - b ☐ Apple II
   - c ☐ PET
   - d ☐ Sol
   - e ☐ Sorcerer
   - f ☐ Altair
   - g ☐ IMSAI
   - h ☐ SWTPC
   - i ☐ Heathkit
   - j ☐ OSI Challenger
   - k ☐ Horizon
   - l ☐ Cromemco
   - m ☐ Xitan
   - n ☐ Kim
   - o ☐ RCA COSMAC
   - p ☐ Other Assembled
   - q ☐ Homebrew
   - r ☐ No System at Present

3. What level of education did you complete (check only one):
   - a ☐ Current student (any level)
   - b ☐ Some High School
   - c ☐ High School Graduate
   - d ☐ Some College
   - e ☐ 2-year degree
   - f ☐ 4-year degree
   - g ☐ Masters degree
   - h ☐ PhD or EdD

4. Your sex: a ☐ Male b ☐ Female

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City _____

State _____ Zip _____

Please circle each number for which you wish information.

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106	107	108	109	110	181	182	183	184	185
111	112	113	114	115	186	187	188	189	190
116	117	118	119	120	191	192	193	194	195
121	122	123	124	125	196	197	198	199	200
126	127	128	129	130	201	202	203	204	205
131	132	133	134	135	206	207	208	209	210
136	137	138	139	140	211	212	213	214	215
141	142	143	144	145	216	217	218	219	220
146	147	148	149	150	221	222	223	224	225
151	152	153	154	155	226	227	228	229	230
156	157	158	159	160	231	232	233	234	235
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   - c ☐ High School Graduate
   - d ☐ Some College
   - e ☐ 2-year degree
   - f ☐ 4-year degree
   - g ☐ Masters degree
   - h ☐ PhD or EdD

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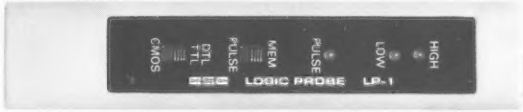

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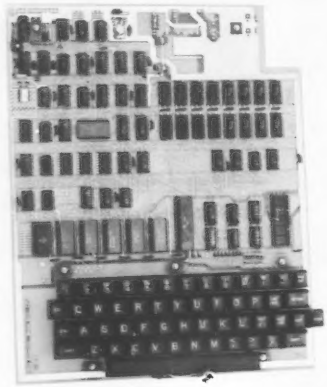

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